OFFICIAL PUBLICATION OF THE PROCEEDINGS AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

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AMERICAN DYESTUFF REPORTER

DEVOTED TO TEXTILE CHEMISTRY · BLEACHING · DYEING · PRINTING · FINISHING

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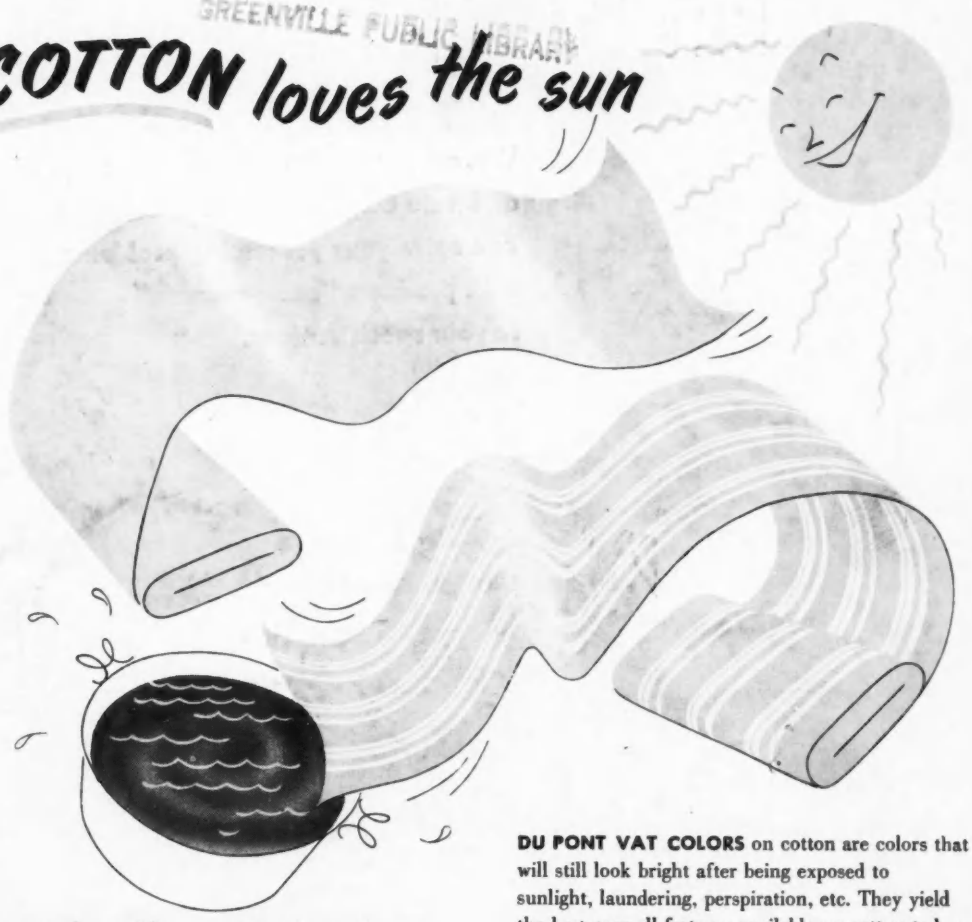
COTTON loves the sun



Always dye with an eye to the end use

Du Pont Dyestuffs

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

DU PONT VAT COLORS on cotton are colors that will still look bright after being exposed to sunlight, laundering, perspiration, etc. They yield the best over-all fastness available on cotton today. The Du Pont line includes PONSOL* (anthraquinone-type dyes), SULFANTHRENE* (thioindigoid and related dyes), and LEUCOSOL* (specially prepared anthraquinone types for printing). Why not investigate these colors? Our Technical Staff will work with you in turning out dye jobs which assure customer color-satisfaction. E. I. du Pont de Nemours & Co. (Inc.), Dyestuffs Division, Wilmington 98, Delaware.

*Reg. U. S. Pat. Off.

NAPHTHOLS

and

BETA OXY NAPHTHOIC ACID

We, as specialists in the manufacture of Naphthols and Beta Oxy Naphthoic acids, can solve your processing problems with products "custom-made" to your specifications.

MANUFACTURED BY

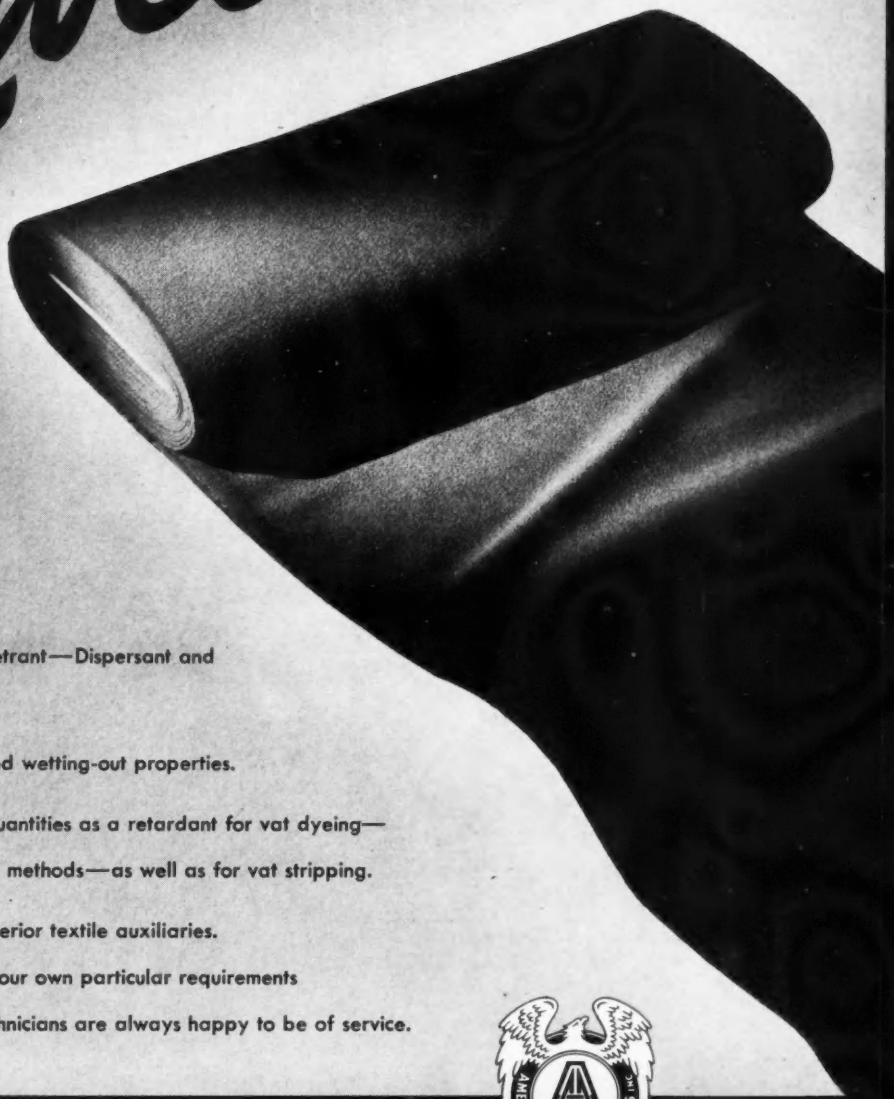
Pfister Chemical Works INC.

RIDGEFIELD NEW JERSEY

A Textile Utility
Product of
Wide Application

NEWLY IMPROVED!!!
now a *four star* product

Levelene*



★ wetting-out
★ preparing
★ dyeing
★ finishing

An effective Leveling agent—Penetrant—Dispersant and active Stripping Catalyzer.

New Levelene has greatly improved wetting-out properties.

Particularly well suited in minute quantities as a retardant for vat dyeing—either in the pigment pad or reduced methods—as well as for vat stripping.

Another of the A.A.P. range of superior textile auxiliaries.
For detailed information regarding your own particular requirements consult our nearest branch. A.A.P. technicians are always happy to be of service.

AMERICAN ANILINE PRODUCTS, INC. 50 Union Square, New York, N. Y. • *Plant:* Lock Haven, Pa.
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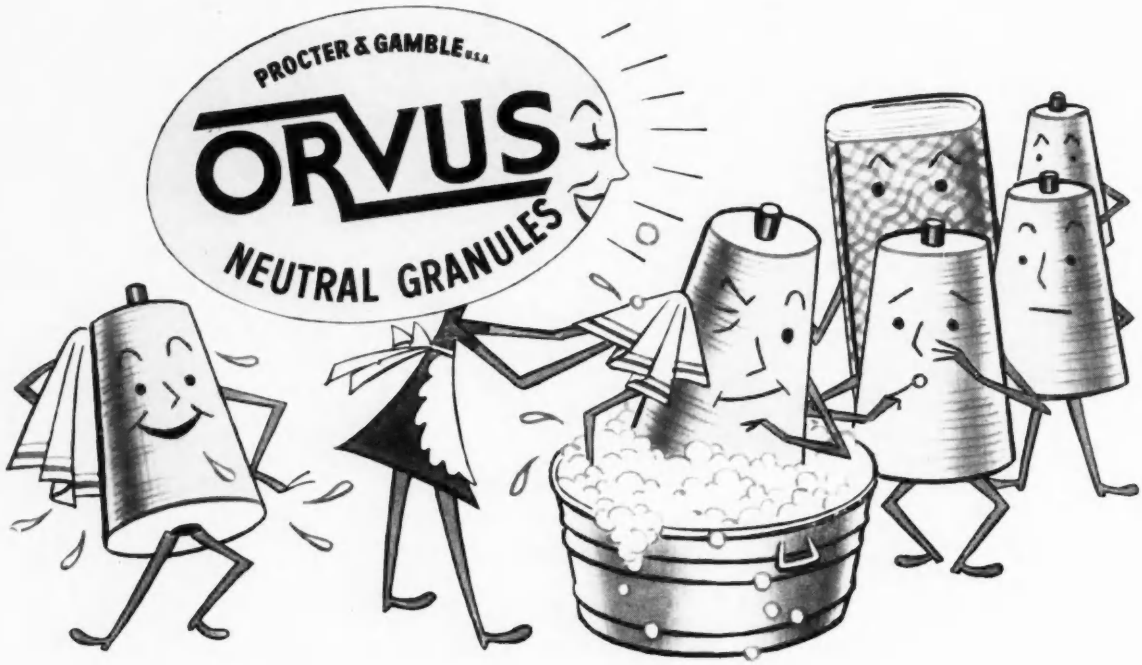
SCOURING

is FAST • • THOROUGH • • SAFE with THIS VERSATILE AGENT!



You've never seen a more versatile scouring agent than Orvus Neutral Granules. This efficient synthetic detergent is well equipped for a workman-like job . . . on any fiber or fabric—cotton, rayon, wool or nylon . . . in any form—stock, yarn, skein or piece goods.

Orvus Neutral comes to you in a particularly convenient form—snowy white, free-flowing, dustless granules. It's easy to measure . . . easy to dissolve in hot water or cold.

Orvus Neutral Granules is designed for fast and efficient processing. It has excellent wetting out and penetrating qualities. Its detergent and rinsing properties are outstanding. It is unusually stable in acid or alkaline solutions and in hard water.

Your first experience with Orvus Neutral Granules will demonstrate its efficiency, versatility, safety and economy. Try it.

P.S. Mighty good for dyeing too!

Can We Help You?

Our Textile Research Department is equipped to help you in working out scouring, dyeing and finishing problems which involve the use of wool oils, detergents and finishes. Feel free to make use of the services this Department offers.

ORVUS Neutral Granules

Made by the makers of Olate, Proxol and Orvus ES Paste

Procter & Gamble

TEXTILE DETERGENTS AND FINISHES SALES DEPT.
CINCINNATI 1, OHIO

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try this for ties

KELTEX

. . . the modern print paste thickener

For CLEAN-EDGED PRINTING . . . TRUE and EVEN COLOR VALUES . . . on tie materials printed with acid, direct and acetate colors on acetate, viscose, wool and pure silk goods.

KELTEX as your thickening agent gives you all of these important advantages:

- . . . No cooking or special treatment
- . . . Readily soluble in cold water
- . . . Easily washed out after printing
- . . . Free from grit and cellulose—needs no filtering or straining
- . . . Exact and uniform printing paste viscosity
- . . . Clean, sharp printing
- . . . Maximum color penetration
- . . . True, even color yield
- . . . Economical to use

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a product of
KELCO COMPANY

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When Toluene Derivatives Are Indicated As Intermediates

Hooker Offers You Many Advantages

COMPLETENESS

As specialists in the manufacture of Toluene derivatives Hooker offers eleven products or intermediates giving you a wide choice from one source.

Sodium Benzoate	Benzoyl Chloride
Benzoic Acid	Benzyl Alcohol
Benzyl Chloride	Benzyl Thiocyanate
Benzal Chloride	Methyl Benzoate
Benzotrichloride	Monochlorotoluene

EXPERIENCE

Hooker's long experience with the development of chlorine derivatives has built a fund of technical knowledge that is available to you in determining the intermediate best suited to your requirements. End product desired, equipment, yield, cost, handling, etc., should be discussed with our technical staff.

QUALITY

The famous Hooker "S" Cell provides a continuous supply of high purity Chlorine. This, plus carefully selected raw materials and the special processing techniques developed over the years, makes Hooker intermediates the highest quality obtainable. This permits substantial savings in manufacturing by eliminating fluctuations due to quality variations.

Data sheets on Hooker Toluene derivatives are available when requested on your company letterhead. Bulletin 320 gives more details on the reactions of these products.

BENZYL CHLORIDE

Synonym	Alphachlorotoluene
Formula	$C_6H_5CH_2Cl$
Molecular Weight	126.5
Freezing Point	−43°C
Distillation Range	5° or less including 179.4°C
Refractive Index, n25/D	1.5365
Specific Gravity, 15.5°/15.5°C	1.107

DESCRIPTION

Colorless to light yellow liquid having a pungent odor. The above data are for the high grade product. Also available as a technical grade with a wider distillation range.

USES

In manufacture of intermediates, dyestuffs, perfume bases, plasticizers, resins, wetting agents, rubber accelerators, gasoline gum inhibitors, pharmaceuticals.

BENZOIC ACID

Synonym	Phenylformic Acid
Formula	C_6H_5COOH
Molecular Wt.	122.1
Melting Point	122.0°C
Solubility, gms/100 gms	
Water at 18°C	0.27
Alcohol at 15°C.	32
Ether at 15°C.	40

DESCRIPTION

White, odorless, crystalline solid, sold in powdered form. U.S.P. grade meets requirements of U.S. Pharmacopeia XIV. Technical grade does not quite meet these requirements.

USES

Dyestuff intermediate, manufacture of perfumes and pharmaceuticals, manufacture of benzoates; preservative for textile sizing, foods, cosmetic creams, lotions, antiseptics, dentifrices, and other pharmaceuticals.

SODIUM BENZOATE

Synonym	Benzoate of Soda
Formula	C_6H_5COONa
Molecular Wt.	144.0
Solubility, gms/100 gms	
Water at 25°C	62.5
Alcohol at 25°C	2.3

DESCRIPTION

Hooker Sodium Benzoate is a white, odorless, crystalline solid in flake or powdered form. Available in two grades, U.S.P. and Technical.

USES

Chemical intermediate; preservative for foods, and as an antiseptic in pharmaceutical and cosmetic preparations. Also recommended as a corrosion resistant additive for certain solutions.

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

2 FORTY-SEVENTH ST., NIAGARA FALLS, N. Y.
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HOOKER CHEMICALS®

10-910

SODIUM SULFIDE • SODIUM SULFHYDRATE • SODIUM BENZOATE • CAUSTIC SODA • MURIATIC ACID • PARADICHLOROBENZENE • CHLORINE

THE NOT-FORGOTTEN FIBER!

Mother and Grandma do not have to be sold on silk. They know all the glorious luxury of a silken gown . . . the rustle, the soft smoothness, the satisfaction of being clothed in the age-old textile of refinement.

Daughter never knew this satisfaction . . . never appreciated what a luxury silk is, until recently. But now that silk supplies have improved, daughter, too, is beginning to want her share of silk garments in her wardrobe. Mother and grandmother and daughter are now buying silks in ever-increasing amounts.

ONYX KNOWS SILK FINISHING

From the days when we were the *first producers in the world* of prepared finishes for silks, we have been the outstanding supplier of finishes for silk goods. Many of the old Onyx finishes are still available, and developments since that time have provided new finishes as applicable to silk as they are to other fibers. Above all, we have not lost our "know-how" in silk finishing. Call on us for advice and suggestions on any silk finishing problems you face.

Here are a few of the Onyx Finishes for silk goods that may be useful to you: Silk-O-Rays* — Scrooping Agents for a better finish that resists aging and weathering . . . Siltex Gum*, Superconcentrated —for silk printing . . . Onyxsans* —Softeners for hands of excellent pliability on silk goods . . . Japcere*—Lubricant . . . Weighter Finish—Weighting Agent . . . Velvosheen* — Softener . . . Chafe Eradicator—Anti-rubbing Finish.

*Trade Mark Reg. U. S. Pat. Off.

Call on Onyx for any assistance we can give you in silk finishing of any kind, either in the recommending of finishes, details of processing, or trouble shooting on problems that may be bothering you.

onyx **CHEMICALS FOR DYEING • FINISHING • PRINTING**

ONYX OIL & CHEMICAL COMPANY
TEXTILE DIVISION
190 WARREN ST., JERSEY CITY 2, N. J.
CHICAGO • BOSTON • CHARLOTTE • ATLANTA

In Canada: Onyx Oil & Chemical Co., Ltd., Montreal, Toronto, St. Johns, Que. *For Export: Onyx International, Jersey City 2, N. J.*

de-spots rust stained textiles too

Pfizer Oxalic Acid does a superior job of removing rust stains from textiles and is easy to handle in the bargain. Pure, white, stable Pfizer Oxalic Acid is low in heavy metals, dissolves quickly, flows readily, will not cake on storage. These characteristics naturally make Pfizer Oxalic Acid similarly efficient as a textile, leather and wood bleach, mordant, laundry sour, catalyst,metal polish, electroplating chemical and chemical intermediate. Interested users are invited to write today for prices and samples.

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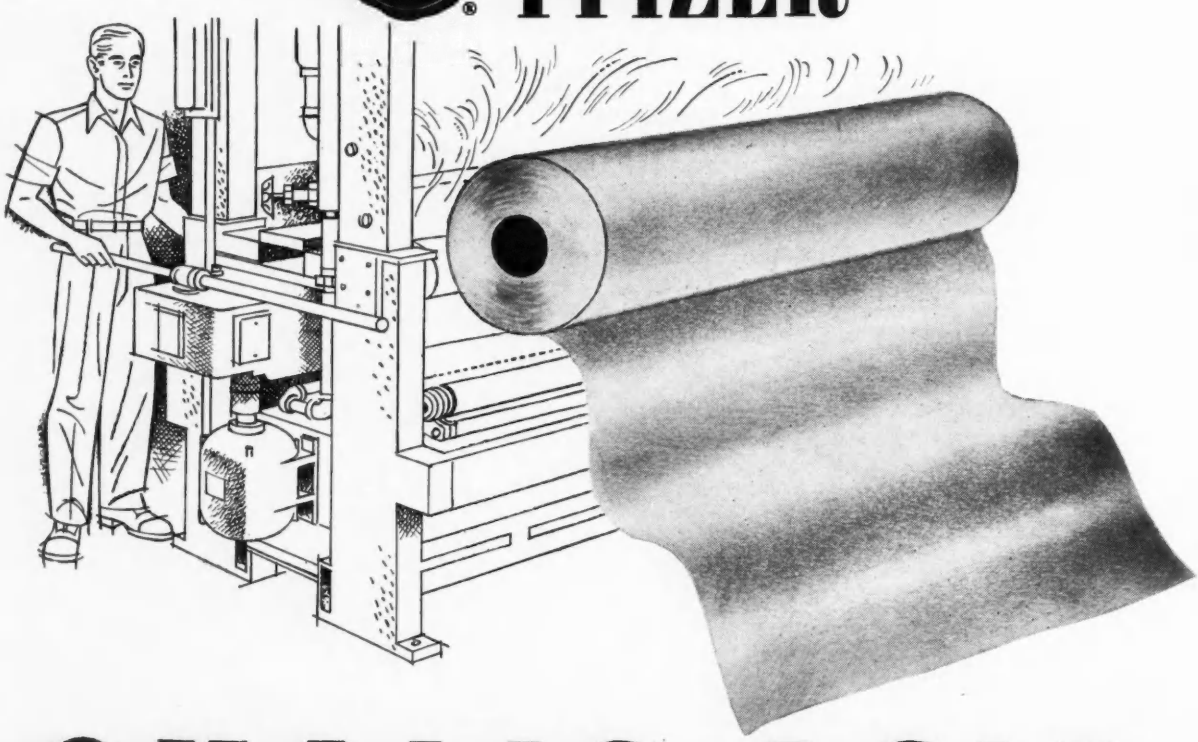
PFIZER



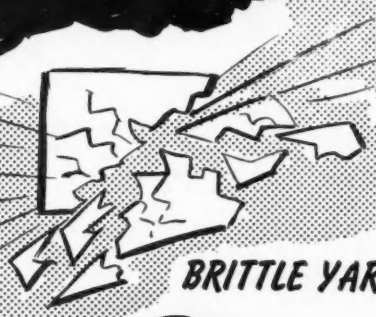
OXALIC ACID

AMMONIUM OXALATE • FERRIC AMMONIUM OXALATE • FERRIC POTASSIUM OXALATE
FERRIC SODIUM OXALATE • FERRIC OXALATE • POTASSIUM OXALATE

CHAS. PFIZER & CO., INC., 630 FLUSHING AVE., BROOKLYN 6, N. Y.; 425 NORTH MICHIGAN AVE., CHICAGO 11, ILL.; 605 THIRD ST., SAN FRANCISCO 7, CALIF.

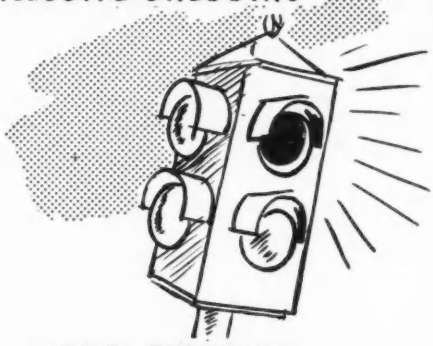
WHATEVER YOUR COTTON SIZING PROBLEM

SOFT WARP



BRITTLE YARNS

EXCESSIVE SHEDDING



LOOM STOPPAGE

Caro-Gant

REG. U. S. PAT. OFF.

WILL SOLVE IT!

No matter what your slashing room problem, the answer is Caro-Gant—the modern, scientific warp dressing. You can eliminate soft warps, brittle yarns, excessive shedding, unnecessary loom stoppage and profit reducing seconds with Caro-Gant—the perfect sizing.

Caro-Gant, the original 100% active warp dressing, contains no water or metallic salts. It is economical because one (1) barrel of Caro-Gant does the work of three (3) barrels of ordinary sizing. In addition, it prolongs the life of slasher blankets and insures minimum shedding and high weaving efficiency. Caro-Gant is the standby of leading mills everywhere.

THE HART PRODUCTS CORPORATION · 1440 Broadway, New York 18, N. Y.

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Rayon Oils & Sizes	Conditioning Agents	Cationic Softeners
Nylon Oils & Sizes	Scrooping Agents	Cotton Warp Dressings
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Synthetic Detergents	Leveling Agents	Mercerizing Penetrants

Hart Products

based on research

Serving the Textile industry

A FAMILY OF CHEMICALS FOR COTTON AND WOOL

COTTON

Piece Goods—Sted, Monsanto's non-sudsing detergent, is powerful yet chemically mild, and won't damage the most delicate fibers. Sted works well in hard water without softeners. Easy rinsing saves time, labor and helps prevent odor.

Flame Retardance—Monsanto's Rezgard A, specifically designed for cotton, meets New York City standards for fire retardants on textiles. Rezgard is a fugitive-type, and water soluble, although it is durable for considerable periods of time. Rezgard does not alter tensile strength, hand, or other characteristics.

Dyeing—A powerful wetting and scouring agent, Monsanto's Sterox proves effective as a dyeing assistant, for a growing number of cotton finishers. Sterox competes favorably with other detergents on a money-value basis.

Merlon—The salability of cotton is greatly increased by the use of the Merlons . . . Monsanto's series of water dispersible resin polymers. The Merlons provide a fine, crisp, durable hand on cotton sheetings . . . a percale-like finish for very little more than the cost of starch. Wear resistance also is improved.

Tickings—The Merlons improve hand, as on sheetings described above. In addition, a special Merlon formulation gives improved wear resistance on tickings.

Dress Goods and Suitings—Resloom, Monsanto's melamine resin, provides durable wrinkle resistance on a wide range of cotton constructions. Resloom has proved successful on millions of yards now in consumer hands; the cotton snubs some wrinkles and sheds the rest. In addition to wrinkle resistance, Resloom provides durable stability.

Direct Dyed Goods—Improved washfastness is gained by the use of Monsanto's Dye Fixative 105. In direct dyed goods, the dye fixative improves the quality without substantially raising the finishers' costs.

Reg. U. S. Pat. Off.: Syton, Resloom, Merlon, Rezgard, Sted, Sterox.

WOOLENS & WORSTEDS

Stock—For the toughest cleaning jobs in the world, Monsanto offers two powerful detergents, Sterox in liquid form, Sted in drypowder form. Monsanto offers specific formulations for your particular cleaning problem. Both detergents are powerful and yet chemically mild, and *rinse easily* . . . saving time and labor.

Syton—Monsanto's colloidal dispersion increases yarn strength from 10%-to-30% depending upon the particular mill. Applied at the picker or gill box, Syton provides better carding, more uniform roping or roving. Because of increased strength, ends down are reduced and it's possible to spin closer to the limit spin. Mills, therefore, get the most value per pound of expensive stock.

Rug Yarns—In scouring rug yarns, Monsanto's Sted gives a uniform, clean base for dyeing. Its chemical action is mild, yet very powerful. Because it is non-sudsing, Sted rinses easily and mills consequently save operating time and labor.

Shirtings, Blankets—The foremost and outstanding method for wool shrinkage control. Woolens with Resloom washability are already on the market, and successful in the most exacting consumer tests. As many as 75 washes with less than 5% shrinkage. Through the new processes, Resloom can now be applied without investment in expensive curing equipment.

Woolen Suitings—Monsanto's Merlon, a series of styrene resin dispersions, gives added body to woolen suitings. Monsanto can recommend one of the Merlon dispersions exactly suited to individual wool fabric requirements.

Suitings—Resloom builds body into the fabric, in addition to washability. The bodying effect produces better drape and better tailor-ability . . . in addition to a hand which retains the fineness of traditional wool suitings.

Piece Goods—Monsanto's liquid-form Sterox is now used in continuous scouring systems for piece goods. Sterox is a powerful, yet chemically mild detergent, which *rinses easily* . . . and cleans thoroughly throughout without damaging the most delicate goods.

MONSANTO CHEMICAL COMPANY, Textile Chemicals Dept., Desk ADT 38, Boston 49, Mass.

Dear Sirs:

Please send me information on textile chemicals for:

Name _____ Title _____

Company _____

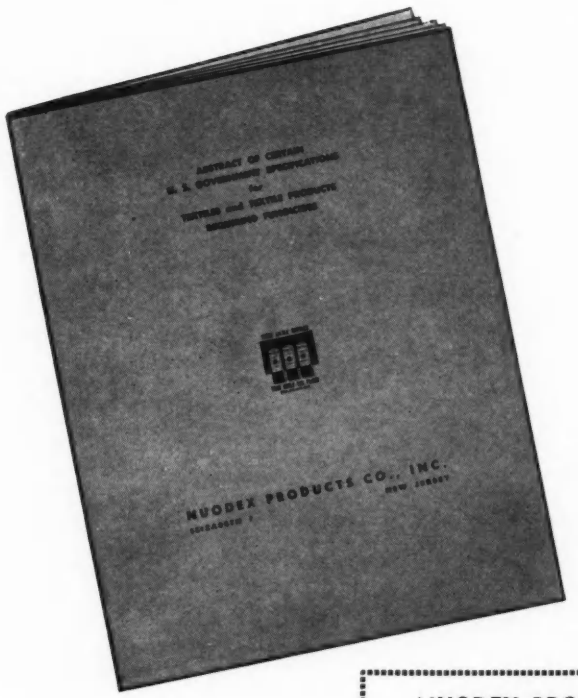
Address _____

City _____ Zone _____ State _____

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

GUIDE TO GOVERNMENT SPECIFICATIONS FOR FUNGICIDE TREATMENT OF TEXTILES



FREE—this new compilation of U. S. Army, Navy, Air Force, Coast Guard and Federal specifications for the fungicide treatment of textiles. Tells you at a glance the individual specification number and title together with the required concentration of the applicable Nuodex fungicide.

This latest abstract of U. S. Government specifications for textiles and textile products requiring fungicides covers over 80 individual items which comprise the bulk of current government textile procurement. It belongs on the desk of every textile manufacturer and finisher.

To get your free copy, fill out and mail the coupon below—today.

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Elizabeth F, New Jersey

Gentlemen:
Please send my complimentary copy of your new Government Specifications for Textiles at once.

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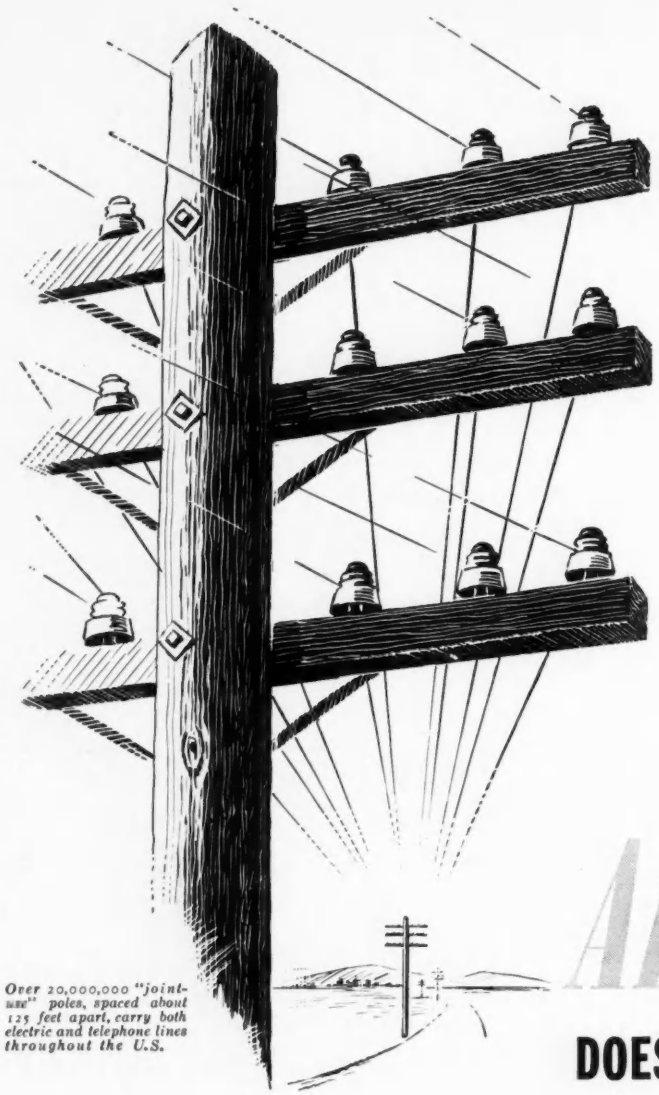
THREE LITTLE BOTTLES

THAT BUILT THE PLANT
REG. U.S. PAT. OFF.

NUODEX PRODUCTS CO., INC.

ELIZABETH F, NEW JERSEY



Over 20,000,000 "jointless" poles, spaced about 125 feet apart, carry both electric and telephone lines throughout the U.S.

Amprozyme

DOES TWO JOBS AT ONE TIME

New De-Sizing Powder Converts Both Starches and Proteins in One Operation

Amprozyme does two jobs better, faster and cheaper. It eliminates the guess work from de-sizing by digesting either starches or proteins, or both, at the same time and in the same operation. If the size is starch, Amprozyme's amylolytic enzymes go right to work. If a protein size is present, its proteolytic enzymes start attacking. Amprozyme insures rapid and complete de-sizing of cottons, rayons, and mixed goods, resulting in a good hand and uniform ground for perfect dyeing, without streaks or shading. Amprozyme eliminates the necessity for two different agents or two separate operations thus reducing storage, handling and shipping costs. It can be utilized at normal or elevated dyebox temperatures, in a wide pH range. Amprozyme also remains stable longer. Detailed information and a sample for a test run are available upon request.

Plants: Passaic, N. J.
Carlstadt, N. J.
Los Angeles, California

WOLF BRAND CHEMICAL SPECIALTIES

JACQUES WOLF & CO.
Chemicals PASSAIC, N. J.

light-fast acetate RED

EASTONE FAST RED GLF

∗30 to 40 hours light fastness
∗good penetration and build-up at 160° to 190° F
∗dischargeable as well as usable for plain dyeing
∗homogeneous and highly dispersed
∗good exhaustion and level-dyeing characteristics

Eastone Fast Red GLF, an acetate dye which produces a medium shade of red, possesses exceptional light fastness, even in pastel shades. One of an entirely new family of dyes, Eastone Fast Red GLF is unique among acetate reds with respect to fastness to light. It is recommended for any combination color where fastness-to-light is particularly desired.

Other properties of Eastone Fast Red GLF include excellent resistance to gas fading, sublimation, crocking, and hot pressing, and very good fastness to perspiration and washing. For further information, write TENNESSEE EASTMAN CORPORATION *(Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.*

Eastman
Acetate
Dyestuffs

Eastman Acetate Dyestuffs are sold in the United States through Tennessee Eastman Corporation in Kingsport, Tennessee, and Lodi, New Jersey. On the West Coast, through Wilson & Geo. Meyer & Co.: San Francisco, Los Angeles, Portland, and Seattle. In Canada, through Clough Dyestuff Company Ltd., 33 St. Mathieu Street, St. Laurent, Quebec.

"I've changed The tag for a medal"

"No more old tags with washing 'instructions' filled with 'don'ts' and 'carefuls' and 'warnings'! I've been SCHOLLERIZED*! I'm completely soap-and-water WASHABLE—*washtub washable*—without fear of shrinkage, matting or felting, change of hand, feel, deterioration of texture or appearance, or loss of elasticity, resiliency, tensile strength or recoverability!"

*U.S. and Foreign Patents Pending

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Manufacturers of Scouring, Dyeing and Finishing Materials, Soaps, Softeners and Sulphonated Oils

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Schollerized Wool is BETTER Wool BECAUSE it's Schollerized!

KERANOL NK

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gives **COTTONS AND RAYONS**

a very **DESIRABLE, SOFT, FULL HAND**

durable to **WASHING AND DRY-CLEANING**

Unaffected by pH variations in the finishing bath—compatible with Resins—very resistant to yellowing, even at excessively high temperatures. Write for our technical service bulletin #208-110.1

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CO., INC.

NEWARK, NEW JERSEY

Manufacturers of Textile & Industrial Chemicals for Over 45 Years

Our customers profit by our expansion

Extensive chemical research laboratories and ultra modern processing equipment produce better products more economically.

For more than 12 years we have manufactured chemical specialties for the textile and allied industries.

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We suggest that you write for complete set.

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California Representative: SIDNEY SPRINGER, 2300 S. Vermont Ave., Los Angeles 7, California

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Canadian Selling Agent: Reliable Color & Chemical Company, 43 Hughson St., North, Hamilton, Ontario

Export Division Manager: Chester Feil, Refined Products Corp.

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To Meet Government Specifications Requiring . . .

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Cold Water Process

NO SOLVENTS

NO FUMES

NO FIRE HAZARD

CARO CW (copper naphthenate)

CARO Q (copper 8-hydroxy quinolinolate)

CARO ZW (zinc naphthenate)

CARO M (mercury)

CAROLINA ANILINE & EXTRACT CO.

CHARLOTTE,
NORTH CAROLINA

for high efficiency in

BLEACHING
DYE OXIDATION

use BECCO

PEROXYGEN compounds

••• You can get whiter, brighter goods at lower cost with BECCO Continuous Hydrogen Peroxide Bleaching. This flexible process, using J-Boxes, couples the efficiency of a continuous flow of goods with the lower overall cost of a BECCO Hydrogen Peroxide bleach. Hydrogen Peroxide 35% and 50% are *safe* bleaches; their mildly alkaline solutions of active oxygen give a highly effective bleaching action. Compared to the batch method, you save on chemicals, steam and overhead.

Hydrogen Peroxide safely and effectively oxidizes vat dyes on all fibers. Easily added to the bath, it rinses freely, leaving no residue.

Other BECCO Peroxygen chemicals for specialized bleaching processes include Peracetic Acid 40% for alkali-sensitive fibers, Sodium Carbonate Peroxide and Sodium Pyrophosphate Peroxide . . . doubly useful as alkaline bleaching agents and detergents.

It will pay you to discuss your bleaching operations with a BECCO representative, a specialist in continuous peroxide bleaching and in the treatment of textiles with active peroxygen compounds. For further information, use the convenient coupon below.

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BECCO SALES CORPORATION, Buffalo 7, N. Y.

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☐ Please have a BECCO representative call.

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City.....Zone.....State.....

PRECISION PRINTING

with COLOR by

INDIGOSOL*

Indigosol Violet IRRN

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VOLUME 39 NUMBER 22

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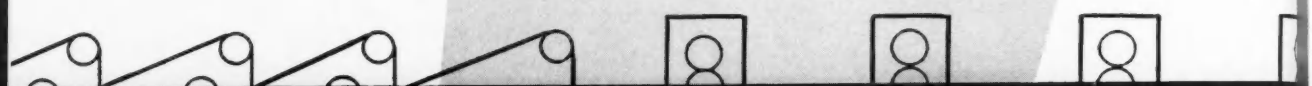
how to save on continuous scouring of mineral oils from woolen piece-goods



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VOLUME 39 OCTOBER 30, 1950 NUMBER 22

PEANUT PROTEIN FIBERS—PILOT SCALE PLANT

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The construction and the operation of a pilot scale fiber spinning plant have been described. Typical operating data for the plant when used to prepare peanut protein fibers have been presented. The fiber production capacity of the plant may be easily varied from 50 to 800 grams of fiber per hour per spinnerette, applying a stretch of 200 to 1500 percent to the fiber during its preparation. Fibers produced with this machine have tensile strengths of 0.86 grams per denier and have been successfully knitted.

THE concept of the artificial production of a proper fiber was set forth in the seventeenth century *(9)*. However, it was not until 1898 that a process for spinning protein into fiber was developed by Millar who extruded a casein-acetic acid solution into air evaporating the acetic acid solvent *(12)*. This stimulated further work to spin vegetable proteins into fibers. In 1937, Traill *et al* in England described the extrusion of peanut protein-urea solutions into an acid coagulating bath to form a new fiber *(28)*. Since that time numerous articles on the progress in making fibers from peanut protein have been published *(2-6, 8, 10, 11, 13-28)*.

In 1942, research at this Laboratory was initiated to produce a fiber from peanut protein. The process developed was, as follows: a peanut protein-alkaline solution is matured, then extruded into an acid-salt coagulating bath, taken up on rolls and treated with salt and formaldehyde solutions, and finally collected as a cake on a bobbin. The fiber is further treated with salt solutions and sulfonated oils to improve its handle *(11)*. The maximum capacity of the experimental bobbin spinning machine used in this development was 30 to 60 grams of fiber per hour under the optimum operating conditions.

Several industrial concerns in both England and the United States have reported pilot-plant production of peanut protein fibers and evaluation of the fibers for uses in various textile fabrics, such as wool, rayon, and cotton. Comparisons of some physical properties of man-made protein fibers and natural protein fibers have been made *(1, 7)*. Harris and Brown *(7)* showed that the Young's modulus, residual elongation, and load at 20 per cent elongation properties of peanut protein fibers compared favorably with other man-made protein fibers.

Pilot-scale data on the preparation of peanut protein fibers should be of value to concerns interested in determining the feasibility of producing the fiber on an industrial scale. The capacity of the pilot-scale fiber spinning machine was planned so that the quantity of fiber spun per unit time per spinnerette was equal to plant scale output. The unit operations data obtained for a machine having the indicated capacity, should be useful to commercial concerns in planning, designing, and developing a full-scale plant. Also, the quantity of fiber, which can be produced by this machine, would be available for evaluation of peanut protein fibers alone and in blends in the preparation of textiles. A pilot scale fiber spinning plant has been constructed, and data have been obtained on a plant-scale unit operation basis per spinnerette. This report describes the operation of the plant and presents data on its operating characteristics.

The preparation of fibers from peanut protein is very similar to the wet spinning process for the manufacture of viscose rayon. One of the characteristics of protein fiber manufacture is that when the fiber is initially formed in the coagulating bath, it has low tensile strength. It is necessary to stretch the fiber and to react it with various chemicals in a continuous fashion to improve its tensile strength, its elongation characteristics, and its resilience. This has been accomplished by constructing a multiple-bath spinning ma-

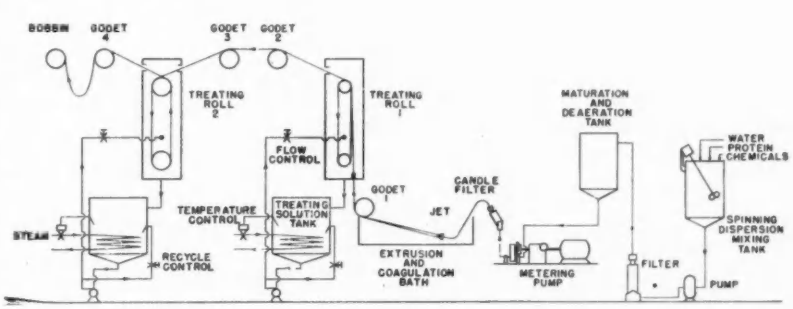

Figure 1

* One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, United States Department of Agriculture.

chine similar to the bobbin spinning machines for viscose rayon and to the experimental bobbin spinning machine previously constructed at this laboratory *(11)*. A material flow sheet is shown in Figure 1 and two views of the machine are shown in Figures 2 and 3.

The extrusion units are the metering pumps with speed control devices, candle filters, and platinum-gold spinnerettes, which are commonly used in the cellulose fiber industry. These units are motor-driven individually, so that close control over the rate at which the fiber spinning solution is being extruded can be maintained.

The rest of the machine, except for the bobbin collection of the fiber, is driven by means of one motor; however, the speed of each component is controlled independently of every other component.

The protein spinning solution is extruded into the coagulating bath to form the fiber. The degree of elongation or stretch that is given the fiber in the bath is controlled by the rate at which the protein solution is extruded into the bath and by the rate at which the fiber is withdrawn or the peripheral speed of the first godet.

The protein filaments are continuously withdrawn from the coagulating bath and carried into the second bath where they are stretched and reacted with salting-out chemicals. The filaments are passed over revolving rolls in a series of turns, and a solution of the salting-out chemicals, adjusted to the desired temperature, is continuously sprayed on the filaments to effect the reaction. Because the filaments are very elastic at this time, the rolls of the second bath are usually truncated cones, so that as the turns of filaments increase, the degree of stretch or tension applied to the filaments, or the peripheral speed of the rolls with their increasing diameter from the truncated section, increases.

As the filaments are continuously withdrawn from the second bath, they are stretched by means of adjusting the peripheral speed of the godets. Then the filaments are carried into the third bath where they are reacted with salting-out chemicals and formaldehyde in a manner similar to that described for the second bath.

The filaments are collected on a bobbin and are reacted further in this form with salting-out chemicals and formaldehyde. After completion of the reactions the fibers are washed with water and dried.

TABLE I

TYPICAL OPERATING DATA FOR PREPARING PEANUT PROTEIN FIBERS[a]

Component		*Speed*		*Elongation of fiber, fraction of original length*	
		R.P.M.	*M./MIN.*	*Between Components*	*Total*
Pump	2	20	6.18	—	1.00
Godet	1	78	31.1	5.03	5.03
Roll	1				
	Back	159	31.6	1.02	5.11
	Front	159	38.0	1.20	6.15
Godet	2	98	39.1	1.03	6.33
Godet	3	105	41.9	1.07	6.78
Roll	2	173	41.3	0.99	6.68
Godet	4	119	47.5	1.15	7.69
Bobbin		119	47.5	loose	7.69

a) Pump capacity, 1.168 ccm. per revolution; spinnerette, 480-hole jet.

The solutions containing the salting-out chemicals for use in the second and third baths are stored in the tanks shown in the rear view of the machine (see Figure 3). These tanks have a capacity of 48 liters of solution and have built-in submerged steam coils for adjusting the temperatures of the solutions. The temperatures are thermostatically controlled, using magnetic steam valves in the lines to the coils. The solutions are agitated by recycling them by means of centrifugal pumps. About 24 liters of solution per minute are recycled, and an additional 2 liters of solution per minute are pumped to and sprayed on the fibers in the baths 2 and 3, the solutions returning to the storage tanks by gravity flow.

Wherever possible, all units of the machine that contact the chemical solutions are constructed of sheet lead or lead pipes to minimize corrosion. Stainless steel pumps and pipe sleeves are used in all other parts which contact the solutions.

The operating characteristics of the pilot scale plant are shown in Figures 4, 5 and 6. It is seen that by selecting the proper pump and spinnerette and by driving the components at desired speeds it is possible to obtain a wide range of operating conditions.

The fiber production capacity of the plant may be easily varied from 50 to 800 grams of fiber per hour per spinnerette, applying a stretch of 200 to 1500 percent to the fiber during its preparation equivalent to making a filament of 2- to 45-denier. For the production of about 50 grams of fiber per hour per spinnerette the metering pump number ½ and the 40- or 90-hole spinnerette are used; and for the production of 200 to 800 grams of fiber per hour per spinnerette the metering pump number 2 or 5 and the 480-hole spinnerette are used. These selections make it possible to drive the metering pumps and components over a

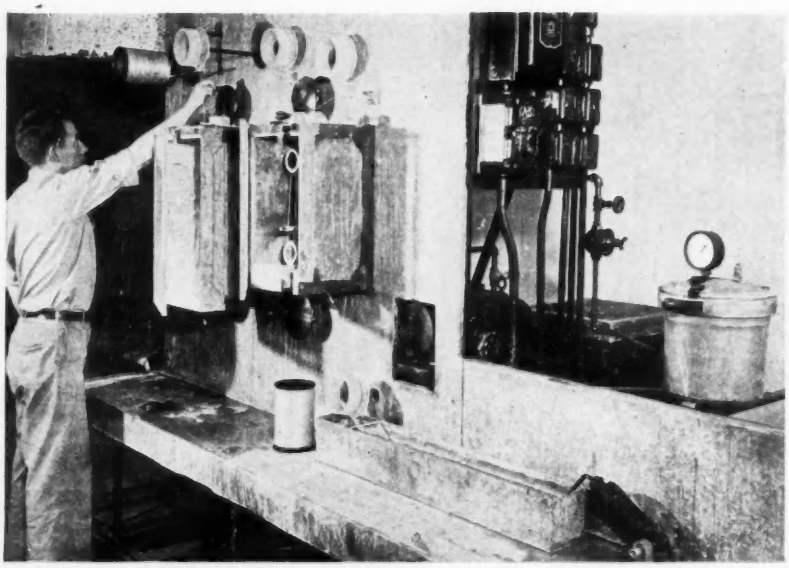

Figure 2

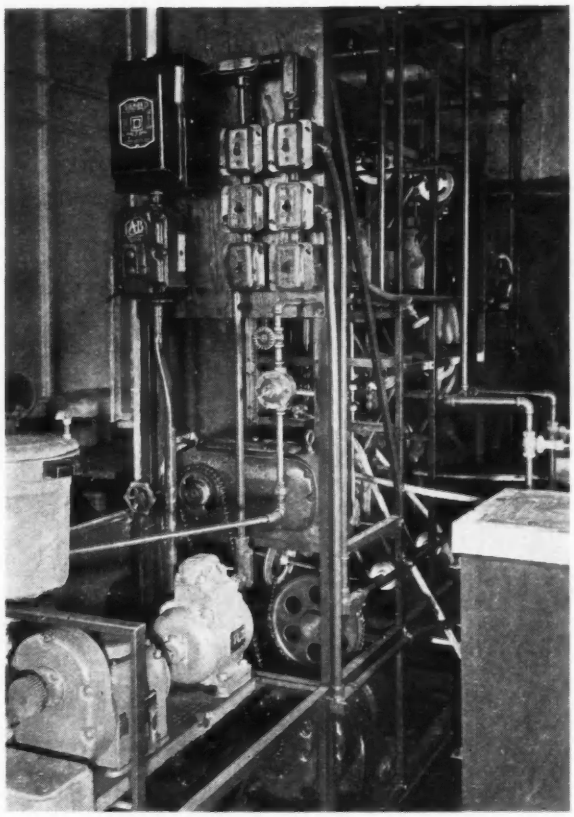

Figure 3

narrow range of speeds and facilitate the operation of the speed controls for the individual components.

Typical operating conditions are shown in Table I.

These data show the type of pump and the spinnerette used and the speeds of the metering pump and the components for the production of about 300 grams of fiber per hour per spinnerette using the described pilot-scale machine.

Fibers, consisting of 480 continuous filaments, have been produced with the pilot scale machine at a capacity of 300 grams of fiber per hour per spinnerette. The peanut protein filaments were about 2.7 denier and had a dry tensile strength of 0.86 grams per denier, a wet strength approximately 30% that of the dry strength, a cream to white color, and a soft handle. These fibers were successfully knitted by an industrial concern to make a textile fabric. Additional textile evaluations are planned, and the results will be subsequently reported.

SUMMARY

The construction and the operation of a pilot scale fiber spinning plant have been described. Typical operating data for the plant when used to prepare peanut protein fibers have been presented.

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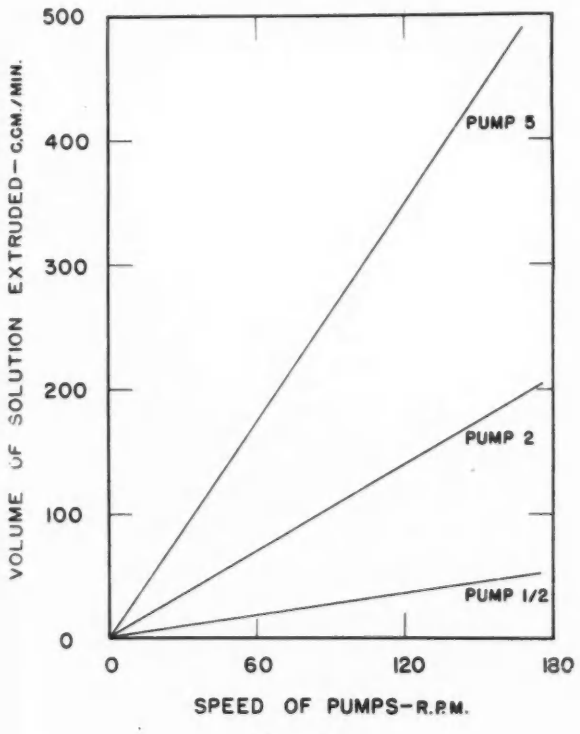

Figure 4

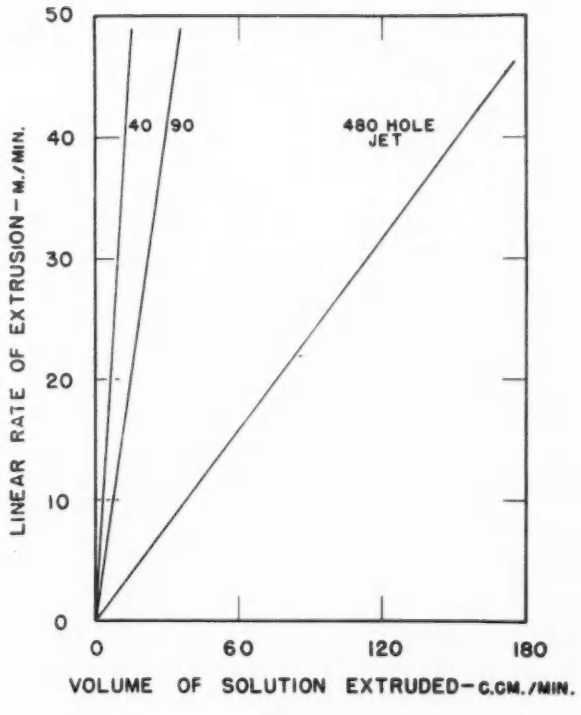

Figure 5

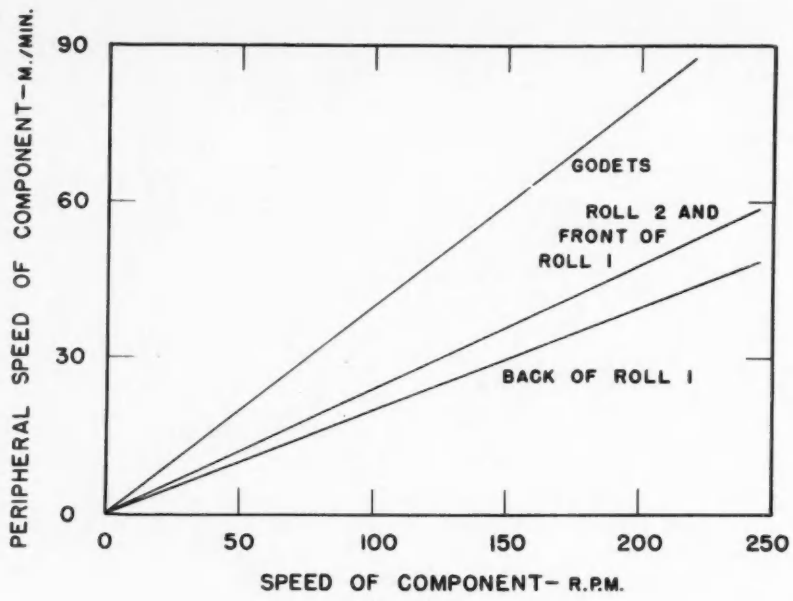

Figure 6

work involved in constructing the fiber plant.

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ABSTRACTS

Aniline Black

W. Popp, *Textil-Praxis* October, 1949, 518.

Aniline black is defined as a dye formed by oxydizing aniline on the fiber with chromates or chlorates in the presence of oxygen carriers (e.g., copper, sulfide, vanadates or lead chromate). Fiber tendering can not be absolutely avoided, but improvements result through application of tragacanth, sulfocyanates, p-phenylene diamine, toluene sulfochloride and soap solutions as well as nitrite, transforming excess aniline into amido azobenzene. The method of developing aniline black by skying the fabrics (impregnated with aniline, oxydizing agents and oxidation catalysts such as CuS or vanadate) is discussed. Formulas for padding with ferrocyananiline (Prudhomme), for printing, developing and finishing white and colored resists and for application prints on base of Prudhomme black are offered. (In German)—P.W.

Thickening Agents During the War and in the Postwar Period

H. Barth, *Melliand Textilber.* 1949, 589.

The author discusses thickeners, which had to replace standard compounds such as starch, British gum, Tragacanth and the like during war time and the subsequent postwar period. Substitutes were: (1) derivatives of cellulose, (2) starch derivatives, (3) synthetic organic substances, (4) inorganic products.

Colloresin V extra, a cellulose ether, had to be replaced by other cellulose derivatives marketed under different tradenames (e.g., Cellappret, Tylose MGA, Roforex and so on). Cellappret is the sodium salt of cellulose glycollic acid (known in the U.S.A. as CMC) of highly alkaline reaction (pH = 8-9.2). It can be used for printing vats, Rapidogenes, Rapid Fast—and Rapidazole dyes. In certain cases this thickener has to be neutralized with dilute hydrochloric acid. Some difficulties have been experienced in using this thickener with chrome mordant dyes

due to coagulation with heavy metal salts. Formulas are offered for printing Fast Color salts, white and colored resists under Variamine Blue and Aniline Black. Quite generally the color yield of these pastes is somewhat inferior to that obtained with starch thickeners. Besides the cellulose glycollic acid thickeners, cellulose alkylethers (Colloresin DK, Tylose WA) have been successfully applied for a long time.

By-products obtained in starch manufacture can sometimes be employed but results are inferior to normal starch products, particularly when thickeners, prepared from corn germs, are used. The study of easily available raw materials is suggested such as horse chestnuts, carob bean and alginates, which could at least be combined with other thickeners.

Polyvinyl derivatives and the like have dispersing properties; they are miscible with other agents. Up to now the price seems to be prohibitive.

Bentonite can better be used in screen printing rather than in copper roller printing due to the fineness of the material, while aluminum sols or reversible gels of metal oxides do not fulfill the expectations. It is concluded that some of the wartime substitutes might also be used under peace conditions. (In German)—P.W.

The Action of Metal Salts on Starch

R. Haller, *Melliand Textilber.* 1950, 49.

Runge assumed more than a hundred years ago *(Farbenchemie II, 45,* 1842) that starch combines with aluminum mordants to form definite chemical compounds. The author investigated this problem by treating potato starch with alcoholic ferrichloride or starch paste with ferric or aluminum acetate. These starch films turned blue and red respectively and the starch particles could no longer be solubilized by malt diastase. The same is true for chromium salt treatments. Certain characteristic reactions of the starch molecule have been eliminated while, on the other hand, the blue iodine reaction persists. Thus it may be concluded that starch has not been changed chemically but that adherent loose compounds have been formed on the surface of the granules being removed again with dilute sulfuric acid, whereupon starch can be completely solubilized by enzymatic action as before. Starch treated with sulfuric acid in the presence of alcohol proved to be identical with the well known "soluble starch" modification. It is further concluded that starch applied for thickening metal salts containing pastes cannot readily be removed by standard washing or desizing treatments because of the resistance of the starch molecules, which contain the forementioned adsorption compounds. (In German)—P.W.

Infra-Red Drying of Textiles

Jos. Schneider, *Melliand Textilber,* April 1950, 284-286.

The author investigated the action of infrared drying, frequently propagated for textile processing. The study was extended to several different fibers. After discussing the theory of infrared radiation it was concluded from his own experiments, carried out with dyed fabrics, that the drying effect on black material was different from that on white textiles and that no absolutely equal effect can be expected in treating material having different light emission; also, some risk might result from drying textiles combined from different fibers by local overheating of one of the components. In contrast thereto the Vezel Institute in Delft (Netherlands) stated that tensile strength and other mechanical properties of cotton, wool, linen and rayon were not impaired by infrared drying. An interesting attempt at combining a standard drying device with additional infrared-drying equipment (Krantz) is reported and illustrated. (In German)—P.W.

Removing Static Electricity in Textile Processing

G. Neuhof, *Textil-Praxis* April, 1950, 224-228.

Formation of static electricity, especially in printing acetate of cellulose, nylon or "Perlon" warps is discussed. The author offers an explanation of this phenomenon: two bodies coming in contact and having the property of accumulating electrons of different charges are apt to produce *more* accentuated differences in charge by *suddenly* separating these two bodies than by *slowly* removing one from another. Reference is made to D. J. Lehmicke's studies *(Am. Dyestuff Reptr. 38,* P853) where fibers and other substances have been classified according to their capacity of acquiring electrostatic charges. Glass fibers stand on the electropositive end, the series extending over wool, viscose, steel, rubber down to the electronegative end, which is represented by Orlon, Saran and polythenes. It has been discovered that by rubbing one of the more electropositive fibers with another nearer the end of this row (e.g., glass fiber with wool) the first one will be positively and the other negatively charged. On the other hand wool rubbed with steel will acquire positive charge and steel a negative one. Thus electrons are assumed to flow from glass to wool and there accumulate the negative charge, which becomes more evident by an abrupt separation of the two substances. This fact has been used in the equipment developed by Sipp-Eastwood Corp. of Paterson, N. J. Warps are first conveyed over glass rods, producing a negative charge on the fibers, and then over a rubber roll, which imparts to the fibers a positive charge, thus partly neutralizing the former charge. Several instruments for testing the electrostatic conditions of fibers have been developed by Keggin, Morris and Yiull (see here *J. Textile Inst.* 1949, T 702). Removing static electricity by ventilation has often been proposed but air by itself, even moisture saturated air, is only a poor conductor. It becomes, however, a conductor by ionization. As early as 1905 the Chapman Electric Neutralizer Co. of Portland proposed the ionization of the atmosphere in fiber processing plants by introducing electricity of high strength through point discharge, producing thereby a constant stream of electrons in alternating direction. This device has recently been improved by a device developed in the Shirley Institute and built by Record E. Co. in Broadheath, England, which transforms the alternate current into direct. Both inventions are explained and illustrated with many details. (In German)—P.W.

Dyeing Hydronblue

Rinneberg, *Textil-Praxis* April, 1950, 247-252 and May, 1950, 309-314.

Hydronblue R appeared first on the market in 1910, followed by the greenish brand G and the more reddish RR. Soon thereafter other shades such as Hydronblue RB and Hydron Navy Blue CN were offered. The great advantages of Hydronblue, compared with Indigo, is in its very easy and speedy application, the characteristic clear yellow shade and the relatively high stability of the vat. Hydrosulfite can be replaced if necessary by cheaper reducing agents such as glucose, copperas and partly by sodium sulfide. Practical detailed formulas for dyeing loose material, sliver and cotton yarns are suggested. These refer first to the hydrosulfite method and then to the cheaper hydrosulfite—sodium sulfide process, the latter being especially used for dyeing cops, cross spools of cotton and spun rayon yarns. Dyeing of cotton fabrics on the jig is discussed, with recommendations and illustrations using jigs in tandem arrangement and continuous, optionally using the pigment pad method or the "Fibe" jig (which consists of 4 rolls forming a narrow container for the padding solution). The vat acid process can likewise be employed in dyeing Hydronblue. By adding acetic acid to the

vat the color change from golden yellow to olive green indicates the formation of free vat acid. Special equipment for dyeing cotton goods in a continuous operation is described. Further information is offered for dyeing knitted fabrics on the winch. Many drawings and photographs of the machines used are included. (In German)—P.W.

"Orema" Dyes in Printing and Dyeing Textiles

F. Enderlin and L. Schibler; *Melliand Textilber.* April, 1950, 267-273 and May, 1950, 340-348.

The development of pigment printing and dyeing in general and the important step of replacing standard thickeners by emulsions is described. Reference is made to the principal difference of the oil-in-water type "Orema" dyes, marketed by Ciba, and the well known water-in-oil type pastes. The superiority of the first class is stressed through pointing at the easiness of cleaning printing rollers, doctor blades, containers, greys, etc., at the better penetration of the hydrophilic fibers by the oil-in-water emulsions, and at the greater security in working with non-inflammable ingredients. A list of the "Orema" products, including a white pigment-emulsion, is offered as well as a characteristic of the quality of these pigments which are available in paste or powder form.

An important product is marketed under the name of "Orema binder" H (Orema-Bindemittel), a very fine aqueous dispersion of oil-soluble, hardenable resins. They form a white salve-like mass, easily diluted with water to a liquid of pH about 6.7-7.2. A catalyst (e.g., ammonium thiocyanate) added to this dispersion has the effect of curing the resin contained in the oil at about 100°C. while the composition is perfectly stable at room temperature; the catalyst is incorporated in the aqueous (continuous) phase. The "Orema" thickener, ready for printing, has to be prepared by the consumer, using a special emulsifying agent (the "Orema Emulgator AC") and some organic solvent—preferably a benzine (spirit) of a boiling range between 100-140°C. and a density of 0.74-0.75. The equipment used to obtain the thickener is described and illustrated. Various compositions and formulas for combining Orema printing colors, optionally mixed with standard thickeners, are discussed in the second part of this article. Practical experiences in printing the Orema colors in the field of roller and screen printing are reported.

Dyeing processes differ from printing in that darker shades are generally required, thus necessitating higher concentrations which might cause undesired hardening of the material. A table indicating the correlation between optimal hardening temperatures and curing times is added, and finishing of Orema-printed or Orema-dyed fabrics and fastness conditions of products of this class are discussed. (In German)—P.W.

Tragacanth Thickeners Compared with Recently Developed Products

K. Walter, *Melliand Textilber.* May, 1950, 351-357.

Tragacanth, not available in European countries during war time, had first been substituted by "Tragu S" (a product not further specified) and later on by "Alkagum", a modified Carob bean thickener. The latter has the advantage of being easily made up in a paste by slurrying it with cold water and boiling for about 15 minutes. A 5% concentration is practically sufficient. This material proved to be superior to Tragacanth and to "Tragu S" not only in the low cost of steam and time saved in preparing the thickener, but also in good color yield and stringiness of the paste. Several printed swatches supplement the article to prove the superiority of prints produced with the aid of "Alkagum" in comparison with "Tragu S" and with standard Gum Trag prints. The samples are mostly produced with vat dyestuffs. Alkagum, highly resistant to alkalis in contradistinction to other carob bean thickeners, can well be used in the so-called caustic Creponne—print style.

Reference is made to Austrian Patent 150.992 (Ver. Faerb. A.G.-Brignon), describing a method for preparing alkali-resistant Carob bean thickeners by a special acid pretreatment. (In German)—P.W.

A Method for Recognizing the Presence of Indigosols

J. Lanczer, *Melliand Textilber,* May 1950, 360.

The presence of vat dyes can generally be proven by treating the dyed specimen together with an undyed blank of mercerized cotton fabric in an alkaline hydrosulfite solution. The dye is transferred in this event to the nondyed sample. This test cannot be used, however, when Indigosols have been applied in dyeing. The presence of Indigosols can be determined by adding some pyridine to the "blind vat" (i.e., the alkaline Hydro solution). 4 ml. NaOH 38° Bé, 4 gms. sodium hydrosulfite and 4 ml. pyridine are dissolved in 100 ml. water; the dyed sample is wrapped in a piece of mercerized bleached cotton and boiled in this solution. The blank takes up the color when Indigosols are present; it remains undyed when pyridine is left out. In the latter event normal vat dyes only are transferred to the white specimen. The author assumes that the difference in particle size between Indigosols and normal vats might be responsible for this reaction. Mordant, sulfur or basic colors, which behave in reducing liquids in some respect like vats have to be previously removed when present. (In German)—P.W.

"Blankophors" As Optical Bleaching Agents in the Textile Industry

E. Koester, *Textil-Praxis* May, 1950, 301-304.

This article contributes to the knowledge of optical bleaching agents with special reference to the products of Bayer, Leverkusen, Germany. A characteristic of these fluorescent agents is in their ability to transform normally invisible short (U.V.) rays into blue to blue-violet visible light, thus partly changing the reddish or yellow shades of the substratum. Krais was first to suggest Umbelliferon derivatives (Esculine) for this purpose (*Melliand Textilber.* 1929, 468). I. G. Farbenindustrie A.G. investigated a large series of products suitable for this purpose (e.g., amino and oxynaphthalene sulfonic acids, derivatives of thiazole and diaminostilbene, and so on). These products are marketed under the collective tradename of "Blankophors" with different indices. Parallel brands are: Uvitex (Ciba), Leucophor (Sandoz) and Tinopal (Geigy). They are water soluble, slightly yellowish powders of anion-active character, useful even in hard water, though iron containers are better avoided. Blankophor G, a brand particularly suited for acetate rayon, has to be mentioned. Samples illustrating the superior effect of Blankophor treated goods (white fabrics, fibers dyed with direct dyes and white discharges on black dyeings) are attached to this article. Reference is made to the review in *Zeitschr. für Angew. Chimie 61* (1949) 1, 17-19 (Petersen) and *Textil-Rundschau* 1948, 376-382 (Landolt).—P.W.

• Reclamation of Fibers

In our issue of July 10th, page 451, a number of papers presented at the Textile Institute Conference, April 18th, were abstracted from the May 5th issue of *Dyer and Textile Printer.* We are informed that the papers which were given at this conference were reported in full in the Journal of the Textile Institute, Volume 41, No. 5, dated May, 1950. Copies of this issue may be obtained from the Institute, 16 St. Mary's Parsonage, Manchester, England.

NOMOGRAPH— CALCULATION OF THE DEGREE OF ELONGATION OF FIBER DURING ITS PREPARATION

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A nomonograph for calculating the degree of elongation of fiber during its preparation is presented. An explanation of the theory, method of construction, and use is given. The utilization of only simple algebraic manipulations illustrates that the construction of such charts is as simple as their application and suggests further uses of the method for solution of routine calculations.

DURING the preparation of peanut protein fibers it is of importance to know the degree of elongation or stretch that the fibers are receiving in the coagulating bath, between different components of the spinning machine, and over the entire machine. The operating characteristics of the machine, such as reported by Arthur and Many *(1)*, can be reduced to a graphical presentation. The quotient of the peripheral speed of a component and the peripheral speed or rate of extrusion of the preceding stage is equal to the degree of elongation of the fiber. This relationship, $A/B = C$, may be expressed logarithmically as $\log A - \log B = \log C$ and rearranged as $\log A = \log B + \log C$. This is recognized as the equation of the straight line, $Y = mX + D$, where $y = \log A$, $X = \log B$, $D = \log C$ and $m = 1$.

For each value of C the equation determines a straight line. Since the slope is constant, a graphical presentation of this equation on a log-log plot yields a series of straight parallel lines, as shown in Figure 1.

To calculate the degree of elongation of the fiber, C, between any two successive stages of operation, read the peripheral speed or linear rate of extrusion of stage 1 along the B-axis and the peripheral speed of stage 2 along the A-axis; then the degree of elongation is read along the C-axis. For example, if the rate of extrusion of fiber through the spinneret (B) was 3 meters per minute and the rate of take-up on the first rolls (A) was 6 meters per minute, then the elongation (C) is 2.00 as determined from the chart. Or even B = 6 meters per minute and A = 42 meters per minute, then C = 7.00 from the chart.

Although this Nomograph was developed particularly for use in connection with fiber spinning, its use could be applied more generally in analysis of operations which involve the relationship $\frac{A}{B} = C$.

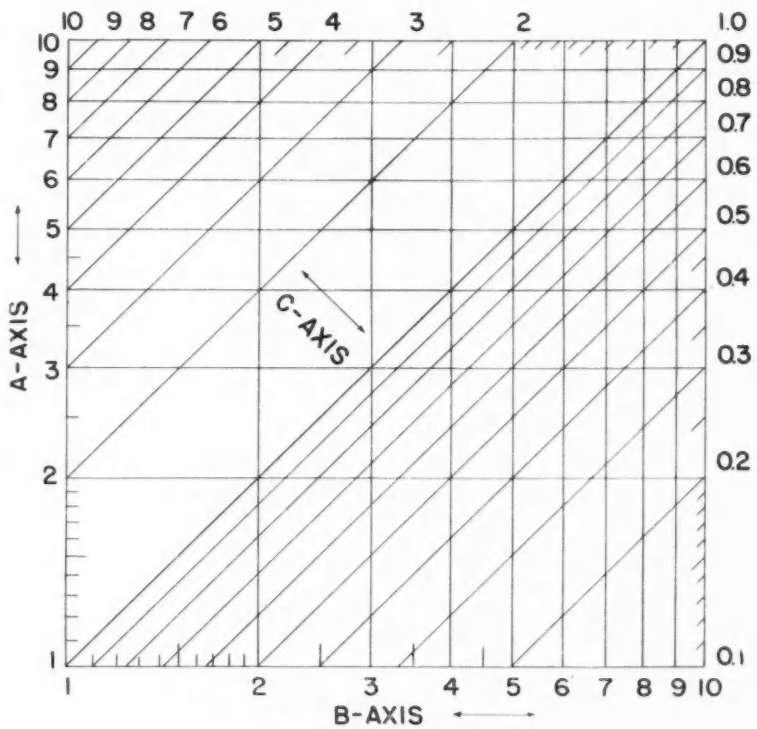

FIGURE 1

NOMOGRAPH FOR CALCULATION OF THE DEGREE OF ELONGATION OF FIBER DURING ITS PREPARATION.

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1. Arthur, J. C., Jr., and Many, H. G., *Am. Dyestuff Reptr.* 39, No. 22, 719 (1950)

* One of the laboratories of the Bureau of Agricultural and Industrial Chemistry, Agricultural Research Administration, U. S. Department of Agriculture.

• PATENT DIGEST •

PAUL WENGRAF

STABILIZING AND STRIPPING WOOL—Replacing Disulfide Bonds by Stable Linkages A 4, 0 2

U. S. Pat. 2,508,713-714
(Harris Research Lab.—Harris, Brown— May 23, 1950

These two inventions are based on the rupture of disulfide bonds of the animal fiber and the rebuilding immediately of new stable linkages. Former methods of Harris Research Lab. comprised an alkylation of the SH-radicals (see U. S. Pat. 2,418,071, REPORTER 512, 1947 and U. S. Pat. 2,434,562, REPORTER 445, 1948). Relinking of the RSH-HSR groups by aldehydes or ketones has further been proposed by Speakman in Brit. P. 453,700, 453,701 and 456,336. U. S. Pat. 2,508,713 is particularly characterized by the disruption of the cystine linkages of keratinous substance by reducing agents and the rebuilding simultaneously (i.e., in the same treating liquid) of this linkage by the introduction of a methylene group through the action of formaldehyde. This simultaneous treatment is essential because the former qualities of the original material are no longer restored when the process is carried out in two separate steps. Enhanced resistance to reducing, oxydizing and alkaline agents results; thus the effect evidently goes beyond a standard shrinkproofing finish. As an example, wool cloth (160 p.) is treated in a bath containing 8 p. sodium formaldehyde sulfoxylate and 32 p. commercial formaldehyde in 4800 p. water (adjusted with phosphates to pH = 7) for one hour at the boil. Even one-half of the above quantity of formaldehyde gives a similar effect since very little formaldehyde is needed for effecting this reaction.

U. S. Pat. 2,508,714 likewise refers to a general method of increasing the resistance of wool to reducing, oxidizing and alkaline agents by disruption of the cystine linkages by reduction and rebuilding of the chain simultaneously by the action of alkylene dihalides (cf. U. S. Pat. 2,434,562, as quoted above). This reaction is particularly useful in stripping colored wool material (e.g., shoddy) where relatively strong reducing agents are required. The standard stripping process, using sodium- or zinc formaldehyde sulfoxylate in acidic solution, affects the chemical and mechanical properties of the fibers. This damage is substantially counteracted, however, by introduction of the alkylene dihalides as re-linking agents. An example cites the dispersing of 1.5 p. dichloroethane in 450 p. borate solution of pH 8.6, adding 7.5 p. sodium formaldehyde sulfoxylate and treating 15 p. wool in this bath, which has to be warmed to 80°C. Sapamine KW especially is mentioned as an effective dispersant for the dihalide.

References cited by the Patent Office, among others (pertinent to both patents):

U. S. Pat. 2,434,562 (1948—Textile Foundation—Harris) and 2,418,071 (1947—Textile Foundation—Harris), see above.

U. S. Pat. 2,403,937 (1946—Du Pont—Lubs): shrinkproofing with formamidine sulfinic acid solution, buffered at pH 8-8.5.

U. S. P. 2,261,094 (1941—Speakman): fixing keratinous fibers by disrupting the disulfide linkages by a treatment with sulfites and maintaining the fibers in this form by linking the sulfhydryl groups to polyvalent metals such as Ba or Ca.

U. S. Pat. 2,206,535 (1940—Du Pont—Lubs): stripping vat- or azodyed fabrics with formamidine sulfinic acid in alkaline or ammonia solutions (optionally in the presence of a quaternary ammonium compound).

U. S. Pat. 2,019,124 (1935—Imperial Chemical Industries): stripping various dyeings with high substituted ammonium compounds (cetyl trimethyl ammonium bromide or the like) of the "Lissolamine" type.

WATER REPELLENT FABRICS —Methylolmelamines, Reacted with Higher Amides and Transformed into Quaternary Compounds G 2, 0 2

U. S. Pat. 2,510,522
(Montclair Res. Corp., Ellis Foster Co.—Rust— June 6, 1950)

By heating a higher fatty acid amide with an alkoxymethylolmelamine, hydrophobic products of waxy consistency are obtained. By further reacting these condensates with an inorganic halogen-containing reagent (phosphorus trichloride) and a tertiary amine (pyridine) water dispersible substances result which impart water repellency to textiles after impregnating, baking and drying. The reaction proceeds therefor as follows: stearamide, palmitamide or the like are heated with a methylolmelamine ether (for instance, hexamethylolmelamine); the mass becomes increasingly viscous and finally sets to a gel. According to the present invention, however, this process has to be interrupted before gelation occurs and the condensate reacted with a halogen-containing substance (HCl, HBr, PCl_5, sulfurylchloride, etc.) after which it is heated in the presence or absence of formaldehyde with a pyridine base. The end product is a salt of a high substituted melamine-pyridinium base. A typical product is described in one of the examples: methoxymethylmelamine formed from melamine, formaldehyde and methanol. The solution in methanol is concentrated to a 50% solid content and mixed with stearamide. Heating of this composition is stopped before the material becomes infusible and insoluble; then paraformaldehyde, PCl_5, mineral spirits and dioxane are added and finally the product is transformed into the corresponding pyridinium base by heating with pyridine. A durable water repellent finish resulted after impregnating, drying and baking at 160°C. for 3 min. The initial spray rating of this fabric, 100, reduced to 85 only after three standard dry-cleaning processes.

The characteristic feature of this process is the interruption of the reaction at a point where the halogen atom (necessary to later form the quaternary compound) can still be easily introduced into the melamine-amide condensate.

References cited by the Patent Office, among others:

U. S. Pat. 2,433,802 (1947—Cyanamid): quarternary ammonium-(pyridinium-) salts of melamine-formaldehyde condensates are decomposed on the fiber by heating to depose the resin. This process is mostly used for producing paper of increased wet strength.

U. S. Pat. 2,420,157 (Cyanamid): water repellent cloth is obtained by applying quaternary ammonium salts of melamine-formaldehyde (see REPORTER 578, 1947).

U. S. Pat. 2,374,259 (1945—Ciba): water repellent and softening effects are obtained by condensing methylolamides with higher fatty acid derivatives of methylolmelamines.

U. S. Pat. 2,357,273, 1944 (Cyanamid): water repellent effects obtained by applying higher fatty amides + methylolmelamines.

Reference is further made to the recently published U. S. Pat. 2,505,649 (Du Pont; see REPORTER p. 523, Aug. 7, 1950).

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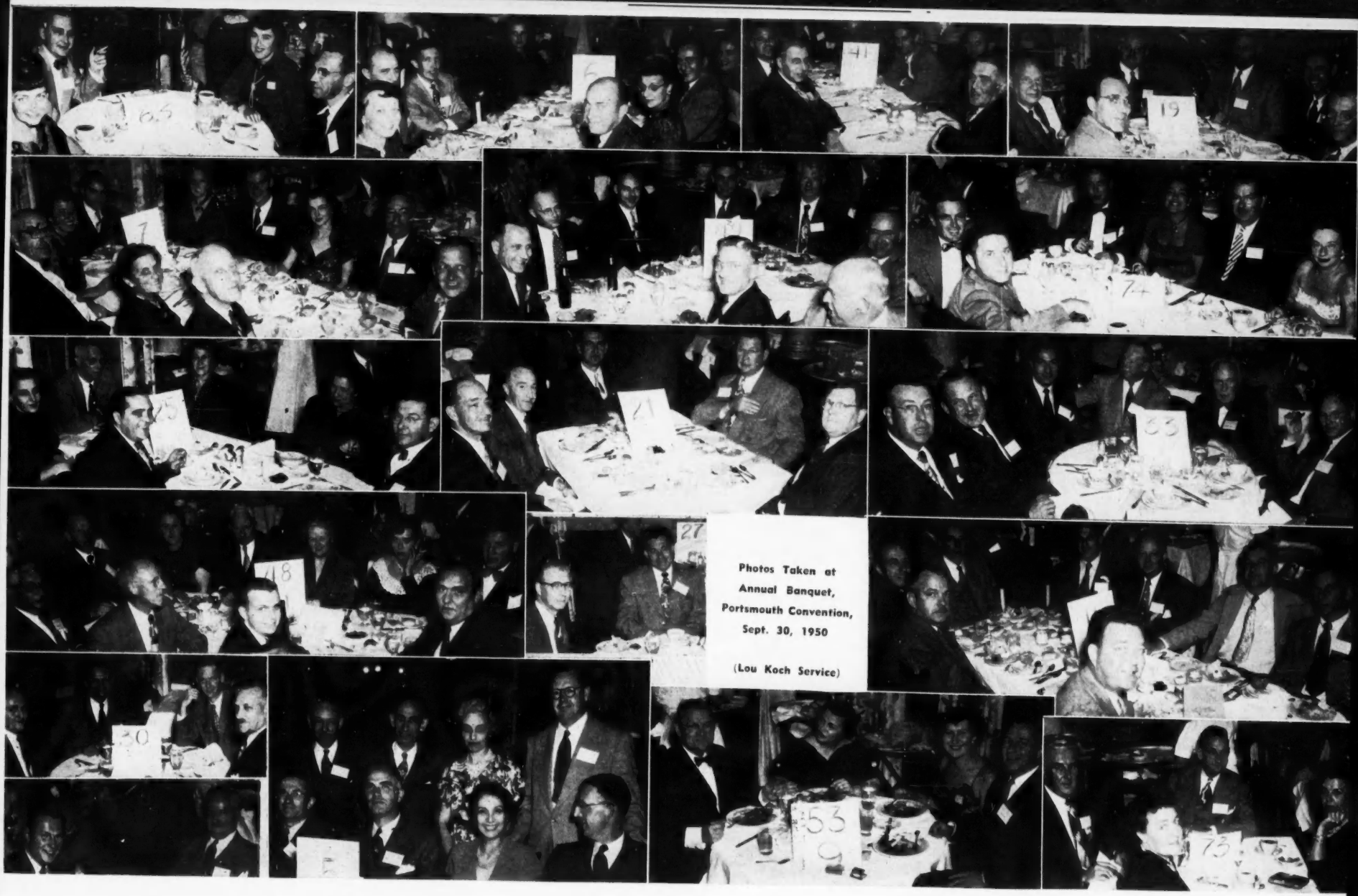

Photos Taken at
Annual Banquet,
Portsmouth Convention,
Sept. 30, 1950

(Lou Koch Service)

Photos Taken at
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Northern New England Section—

THE TEXTILE INDUSTRY AND STREAM POLLUTION

JOSEPH A. McCARTHY

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The pollution of streams by industrial waste waters, particularly those of the textile industry is discussed from the point of view of its elimination by intelligent use of various available methods without an undue burden on manufacturing costs. In some instances proper solution of the problem of stream pollution even effects direct savings in heat and in supplies.

The author explains how streams, through bacterial action, can handle a certain maximum amount of impurities without the development of odors or other evidences of pollution. The amount of oxygen consumed in water in such natural purification is called biological oxygen demand (B.O.D.). When more impurities reach a stream than can be handled by the oxygen present in the water, pollution results.

Streams are divided into four classes with respect to purity from Class A, suitable for drinking, to Class D, suitable for transportation of sewage without nuisance, for navigation, for power and for some industrial uses. Various states are establishing programs by which, in cooperation with industry, all streams are to be brought within at least Class D, that is, by which objectionable stream pollution is to be eliminated.

IT is hardly necessary in talking to a group of textile chemists like this to stress the importance, in fact the absolute necessity, of clean water for our present civilization and our present economy, but the recent shortages in New York and in many parts of New England, by no means completely eliminated, must remind us all forcibly that our water resources are not unlimited.

For domestic purposes alone, each of us requires about 100 gallons per day, and the average daily consumption increases constantly as our standards of living become higher. For industrial use, especially in the textile industry, it is absolutely essential that there be an adequate water supply.

All of our water comes to us originally in precipitation from the skies, and we find it in our streams or in storage in the earth. Although all of it is originally clean, when water flows along in streams or is stored in the earth, it tends to pick up both dissolved and suspended impurities, some of which are organic and some inorganic. Generally natural processes take care of these picked up materials, and the water remains clean. It is only when man appears on the scene that pollution occurs.

Let us list some of the important forms of pollution as they affect our use of water: we have bacteria, some of them pathogens, the direct causes of disease; depletion of dissolved oxygen and increased biochemical oxygen demand; suspended matter of all kinds; scums and greases; toxic substances, mineral, organic and bacterial; and from some or all of the above, odors, tastes, colors, unsightly appearance and the formation of sludge deposits. Much of this pollution in its various forms comes from human waste, and of course bacterial pollution is very largely from this source. Yet organic wastes frequently contribute bacteria, including at times pathogenic varieties. A very considerable part of our pollution comes from industry. In Massachusetts we have about 150 plants, each of which produces annually more than five million dollars worth of goods, and 90 per cent of these have wastes which are at least potential pollution problems. Our textile industry is of course one of the most important in Massachusetts and New England, and it contributes at least its share, and perhaps more than its share, of pollution, and this contribution includes to some extent all of the forms we have just discussed. Considerable numbers of bacteria, including occasionally even pathogenic types, can be found in many textile wastes; large amounts of both dissolved and suspended matter are discharged from the mills; operations such as dyeing contribute color and toxic materials; and many operations, especially scouring, dyeing and bleaching, affect the normal pH of the streams, as do some of the rayons; and all of these may affect the odor, taste, color and general appearance of the stream.

Probably the most significant pollution agents contributed by the textile industry, especially those plants handling wool, are grease and oxygen-consuming materials. We have found by careful examination of the wastes coming from a number of woolen mills, that the wastes from scouring contained fats equal to nearly 10% of the total weight of wool handled; smaller but still considerable amounts of grease come from finishing and cloth washing, and still smaller amounts of grease arise from other operations.

Probably the most important consideration from a pollution standpoint, however, is the biochemical oxygen demand (B.O.D.), which for our purposes we may consider as the amount of oxygen required to oxidize materials in a stream under the influence of the bacteria present. This is the measure of pollution most commonly used in sanitary science.

Our laboratories determine the amount of oxygen requirement by incubating known dilutions of waste or sewage in oxygen-bearing water similar in characteristics to that found in our streams, and determining the amount of oxygen depletion. This laboratory test correlates well with what actually goes on in the stream.

Many textile wastes have high B.O.D., and wool scourings especially show extremely high demand. An intensive study of wastes from four mills showed that the average amount of B.O.D. was equal again to about 10 per cent of the weight of the wool scoured. Dye wastes, some finishing wastes, and the result of other operations from woolen and worsted mills, and kier liquors and certain other wastes from cotton operations, also show fairly high B.O.D. content.

A round-figure estimate of the amount of material with B.O.D. from the woolen and worsted mills in Massachusetts indicates an annual discharge of thirty million pounds from wool scouring, five million from dyeing, two million from finishing, and about three million from other operations; or a total of forty million pounds per year, or about 150,000 pounds per working day. What this means in terms of effect upon our streams may be shown by considering the oxygen ca-

* Presented before Northern New England Section in Boston.

pacity of water.

At 60°F. water when fully saturated contains 10 parts per million of dissolved oxygen, or about 83 pounds per million gallons. It is generally agreed that reduction of the dissolved oxygen in a stream much below 20 per cent of its saturation value may give rise to nuisances; so we may fairly estimate them about 67 pounds of oxygen per million gallons as available for counteracting pollution.

Of course streams deficient in oxygen tend to reaerate themselves, but this is far from being an instantaneous procedure. A million gallons of well-aerated water may be expected to receive without nuisance about 67 pounds of B.O.D.; so that to satisfy the requirements of our woolen wastes alone, about sixteen hundred million gallons of water is necessary each day.

How much water do we have? The annual rainfall in Massachusetts is about six million million gallons, and probably not much more than one-third of this reaches our streams, the rest evaporating, entering the ground, or becoming part of vegetation. We may expect then to have available an average of about six thousand million gallons per day. Without reaeration and without treatment of wastes, about one-tenth to one-fourth of all our rainfall would be required to furnish transportation of wool wastes without nuisance; but, because neither rainfall nor distribution of waste is uniform over our state, we have considerable areas of high pollution.

What is being done about regulation of the discharge of pollution? In 1875 the Massachusetts Legislature, recognizing the importance of control of pollution, directed the then State Board of Health to begin appropriate investigation. It might be worth while here to quote the words of the General Court:

"We propose to clothe the Board with no other power than the power to examine, advise and report except in cases of violation of the statutes . . . its decisions must look for their sanctions to their own intrinsic sense and soundness . . . its last protest against wilful and obstinate defilement will be to the General Court. . ."

From time to time since then the Legislature has found it advisable to modify somewhat this viewpoint and to give to the Department of Public Health powers more nearly mandatory over certain river basins and other areas; and in 1941 laws were passed which generally prohibited pollution from any source not established before that year.

The problem growing more and more complex and serious, in 1945 the General Court set up the present law, Chapter 615 of the Acts of 1945, directing the Department of Public Health to prevent pollution and contamination of any water in this Commonwealth. The regulations adopted under this law prohibit the discharge among other things of sewage and manufacturing waste products into any water except as such discharge may be approved by the Department of Public Health "when in its opinion the best practicable and reasonably available means to render the same harmless have been provided in accordance with plans approved by the Department." Such broad authority, of course, must be exercised with reason, and it should be noted that the words "reasonably available" are carefully included in the regulations. Every action taken by the Department under these regulations has shown its intent to proceed in a reasonable manner.

It has always been recognized that the control of stream pollution is quite largely an interstate affair, and so there has been formed a voluntary association of states, now approved by the Congress, known as the New England Interstate Water-Pollution Control Commission, which now includes Massachusetts, Connecticut and Rhode Island, and which the other New England states are expected to join as soon as local enabling legislation is passed. New York State has already agreed to take joint action as far as concerns those portions of the state which are included in the New England drainage basins. Furthermore, the work of each of these states and of the Interstate Commission is necessarily influenced by Public Law 845, the present National Stream Pollution law under which the United States Public Health Service studies pollution and methods of abatement, and may make recommendations to a state or a group of states, although the legal control of pollution and the enforcement of pertinent laws is still a function of the individual states.

It is obvious that all of our streams cannot be expected to be used solely for trout fishing and recreation, and it is equally obvious that we cannot allow all of our streams to become sewers. So all of these regulatory agencies have agreed that the best study, control and abatement of pollution requires some classification of streams and the adoption of suitable standards. The Interstate Commission has set up four main classes according to the highest intended use of each particular body of water; the classification is briefly as follows:

CLASS A. Suitable for public water supply or any other purpose; a uniformly excellent water.

CLASS B. Acceptable for public water supply after filtration and disinfection. Suitable for bathing and recreation, irrigation and agriculture, good fish habitat, good esthetic value.

CLASS C. Acceptable for public water supply only with the highest degree of treatment. Suitable for recreational boating, irrigation of crops not used for consumption without cooking; habitat of shad and other hardy fish.

CLASS D. Suitable for transportation of sewage and industrial wastes without nuisance, and for power, navigation and other industrial uses.

Waters falling below these descriptions are considered as unsatisfactory.

This classification is intended to divide equitably our water resources, and to make available each stream for the highest possible use.

The Massachusetts Department has completed the survey of many of our streams and has made tentative classifications. Most of our small streams are in Class A or B. It is obviously necessary to maintain the A streams in that class, and it is hoped that many of those streams now lower in classification can be improved. Most of the larger streams for at least part of their flow are in Class C, and it should not be too difficult to bring about sufficient improvement so that a very large part of all those streams will be in C. Parts of these large streams, and parts of a very few of the smaller streams are in Class D, and some of them probably may be safely continued in that classification, with, we hope, some reduction in length of the portions now in D. But we also find that short parts of some of our rivers, and in a few cases the larger parts, are below Class D. Since this means that such streams cannot carry their present pollution loads without nuisance , it is in regard to these areas that the major stream pollution abatement programs of the Department must be aimed.

Action toward improvement of many of the worst areas has already been taken, particularly where the major part of the pollution has been found to be domestic sewage. In several cases municipalities have cooperated with the Department, have received its technical assistance, and treatment plants are nearing completion or at least plants have been prepared. In a few instances such cooperation has not been shown, and the Department has proceeded through the courts to compel action. The Department has also assisted in several areas where pollution has been largely industrial, and so far court action has not been considered necessary in any industrial problem. It has not been the policy of the Department to take any mandatory action unless a complete lack of cooperation is demonstrated.

The survey has shown that many areas falling in Class D or worse are largely affected by pollution from the textile industry. It may be that some of these bad

spots may be the result of a flow of water entirely inadequate to take the pollutional load even with almost complete treatment; in other cases the balance between load and stream capacity is so close that either treatment must be afforded or no further increase in the load can be tolerated. But in most cases we know from our past experience with even partial treatment that the stream not only can be improved to the nonnuisance level, Class D, but even promoted to the more satisfactory C rating.

What are the means for reducing pollution loads? We have sedimentation and equalization, chemical treatment, and biological treatment, and we also have the possibility of changes in processes. Please don't dismiss this possibility lightly. So far most of our experience along this line has been in other industries, but here and there when we have shown a plant that its pollution load was more than its fair share of the capacity of the stream, surveys have shown the opportunity not only of reducing the amount of B.O.D. suspended solids or of grease discharge, but better still of recovering useful products, not the least valuable of which are usable water and heat. In one chemical plant a survey undertaken as a result of our request for a reduction in B.O.D. resulted in a reduction of over 50 per cent in water use, a substantial saving through reuse of a by-product that had previously been too much diluted for recovery, and the saving of a good many thousand B.T.U.'s in wasted heat, as well as the desired lowering of the load.

Equalization and sedimentation may in some cases bring about reduction in pollution sufficient to solve a given problem. But the benefits from these simple inexpensive processes are not gained by haphazard construction of tanks of a size and shape convenient to the space available. It is generally necessary to study carefully the various types of wastes being discharged, for example, to check the best mixing ratio and the optimum detention period, and perhaps even to use intermediate settling tanks before the final settling tank. In cases where the main problem comes from intermittent discharges of material objectionable because of color or of high or low pH, equalizing tanks of adequate size, properly operated and controlled, may furnish a complete solution.

Many times, too, mixing of two or more wastes will produce reactions that result in the deposition of much more suspended matter from the mixture that can be obtained by separate settling of the individual wastes. We found, for instance, that judicious mixture of the various wastes from vat dyeing brought about interreactions that precipitated out considerable amounts of B.O.D. materials previously held in solution, and gave a supernatant liquor relatively inoffensive in color and in pH. We have even married alkaline wastes from textiles with acid wastes from a chemical plant, with benefit to both.

The best example of such joint action is in Bound Brook, New Jersey, where twenty-five million gallons of acid wastes from American Cyanamid and tons of spent lime from Johns-Manville are brought together each day to produce a relatively clear neutral supernatant and furnish at least partially satisfactory treatment for both plants.

One extremely important result of proper sedimentation is the removal of suspended B.O.D. to such a degree that the B.O.D. remaining in solution is carried out to sea, to deep water, or at least to parts of the stream with higher oxygen capacity, instead of being precipitated relatively near the plant to form sludge banks where the material continues to exert a demand on the stream, which might otherwise be able to cope with the current load. But it must be remembered that the use of these simple methods demands adequate individual studies and equally adequate control.

When with many textile wastes simple sedimentation does not give sufficient removal for adequate treatment, assistance must be sought from chemicals. Much work has been done from time to time with standard coagulants, such as alum and various iron salts, and it has been found that with dilute wastes, such as those from wool dyeing and finishing, the use of these coagulants does not precipitate out enough additional material, as compared with plain settling to warwant the additional expense. With other alkaline wastes, like kier liquors, for example, acid alone or acid with various coagulants may throw down enough material to warrant the expense, but carbon dioxide for flue gas will do as well and is generally much cheaper.

Many attempts at coagulation of wool scourings proved fruitless either because of enormous cost or because the coagulants failed to affect the tight emulsions involved, or because grease recovery was poor. A few years ago a process using calcium hypochlorite was installed in one of our mills with satisfactory results. The calcium chloride-carbon dioxide process developed at the Lawrence Experiment Station makes use of inexpensive flue gas to neutralize caustic alkalinity, and then cracks the emulsions with calcium chloride. This process has worked well on a pilot scale, and one small scouring plant is now using it to effect considerable reduction in pollution.

In both these processes using calcium salts, which are generally much cheaper than any other coagulants, practically complete removal of grease and of suspended matter, including suspended B.O.D. material, can be obtained. Solvent extraction of wastes must be included in chemical treatment; one large mill uses such a process, and the development of a newer adaptation is practically complete.

All of these processes can give practically complete removal of grease and suspended matter, and this degree of treatment may be sufficient if the receiving stream has enough oxygen capacity; but as much as 30 to 40 per cent of the B.O.D. material in wool scourings may be in solution, which may mean up to 4 pounds per 100 pounds of wool scoured, and the amount may thus impose an excessive load on even a large stream. Experiments have shown that much of this dissolved material may be removed by further coagulation, but the cost becomes excessive.

Biological treatment of sewage, especially on trickling filters where the sewage is allowed to trickle slowly down through layers of crushed stone upon which films of active oxidizing bacteria develop, has been standard practice for many years, and more and more industrial wastes are now being treated in this fashion. Experiments have shown that degreased wool-scouring wastes may be filtered to obtain almost any desired decrease in B.O.D. Likewise, wastes from dyeing and finishing can be treated on trickling filters, and experiments have shown that the color from waste dyes may be completely removed by such filtration. Bleachery wastes are now being filtered in one of our large plants. In most cases textile wastes are not too unlike domestic sewage, and a careful study of the best filter characteristcs and of the optimum liquid rate and loading of B.O.D. material generally leads to very satisfactory filter effluents.

However, none of our processes is yet perfect, costs are often too high, and recovery of valuable by-products, including water, is not yet as complete as possible. A grant of $12,500 from funds has been made available in connection with the National Stream Pollution Program, and work is now under way at the Experiment Station and at Lowell Textile Institute, where a complete wool-scouring plant in miniature will soon be in operation.

In the work as now planned we are to make a careful study of the amounts and kinds of grease in the wool, in the scour-

ing bowls, and in the various treatment processes, including those now in use and proposed modifications. We know from our studies and yours that great quantities of valuable grease are being discharged from every plant that scours wool. We know that it is possible experimentally to recover 50 per cent of all grease by centrifuging, but we know also that in general mill practice less than half as much is recovered. We know that large amounts of soaps and of soda are also being thrown away. We feel sure that in better recovery of these valuable products, and perhaps usable water as well, lies the hope of reduction of pollution without imposing heavy costs on the industry.

We intend to study further various cracking processes, since we feel that present practice, especially acid cracking followed by pressing, wastes much grease, particularly the valuable higher-melting fractions. We want to know what takes place in the various steps of scouring and treatment, and to apply this knowledge to reduction of pollution. We believe it necessary in making these investigations to increase our knowledge of the effect on the fibers. We realize it would be futile to propose any method of scouring or of treatment that would produce an inferior grade of wool.

We are not convinced that the last word has been said on solvents, either in scouring or in waste treatment. We have found that solvent treatment still may lead to the discharge to the stream of as much as 15 per cent of the original grease. We know that many ideas have been advanced, some of which have promise. We know that in other industries extraction methods and particularly solvent-recovery methods are based on more modern conceptions of physical chemistry than some of those now in use in the textile industry. We feel quite sure that fractionating towers must be investigated as to the possibility of use in solvent recovery. Refrigeration and modern filtration methods might be useful.

We know that in many plants liquors are recirculated in scouring, and we feel that it is not impossible that a continuous closed system with treatment, coagulation and filtration between bowls might show considerable savings for the industry. In all these investigations we will be guided by an advisory committee representing the industry throughout New England, and we hope as the work develops that these men may combine their knowledge with ours toward a thorough investigation of many sides of the problem, new and old.

This entire work, as has always been all our thinking on the subject, is based on the premise that, while treatment of wastes and other methods of reducing pollution must be considered an unavoidable part of modern industry, it should not involve undue costs, and it certainly should not be so expensive or so complicated as to cause any industry to think of moving or of locating new plants elsewhere. In this regard, however, we know as well that many other states are now adopting rules and regulations much more severe, and perhaps not so reasonable, as those in force in New England, and, as perhaps many of you know, in certain states it is now necessary to install complete treatment plants before the producing plant can be operated at all.

In addition to this grant, the New England Interstate Pollution Commission has set up nearly $7,000 for study of other textile wastes, and work is now under way at Wesleyan University in Connecticut and at the University of Rhode Island with cooperation from representatives of the Massachusetts Department.

We realize that, in spite of our experience for many years with many kinds of wastes, solution of our problems in connection with textile wastes can only approach completion by the closest cooperation with all of the textile industry. This we have had in the past, this we are now enjoying, and with its continuation in the future we hope we may be of assistance to our greatest industry toward a satisfactory solution of the problem of obtaining and retaining the greatest asset of that industry, clean water.

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Report of LTI Student Chapter

THE first meeting of the college year was called to order by Chairman Sumers. Co-Chairmen for various committees were announced as follows:

Program—R. Olney, S. Lein.
Publicity—F. Shippee, B. Dickison.
Membership—E. Khoury, R. Simmons.
Bylaws—G. Barry.

The Intercollegiate Chemical Society outing, which will take place in the Blue Hills area of Boston, was brought to the attention of the members. The next regular meeting of the Society will be Nov. 29, 1950.

The next annual meeting with the NNE Section, to be held next spring, was brought to the attention of the members. Joseph Panto was named to begin immediate planning.

Robert Pierent was elected new faculty advisor, and Prof. Ernest James the associate advisor. It was voted to extend Prof. James a vote of thanks for his excellent work in the past as faculty advisor.

The program committee was assigned the following tasks:

(a) Arranging for the five minute papers to be given by students at each business meeting.

(b) Looking into the possibility of having demonstration experiments replace the five minute papers at certain meetings.

(c) Considering a suggestion for having informal lectures on subjects outside the chemistry field.

Respectfully submitted,
ALFRED J. RICHARD, *Secretary.*

CALENDAR

GENERAL RESEARCH COMMITTEE
November 17, 1950 (Hotel Commodore, New York); January 19, 1951 (Hotel Commodore, New York); April 20, 1951 (Raleigh, N. C.); June 15, 1951 (Hotel New Yorker, New York); October 18, 1951 (Hotel Statler, New York); November 16, 1951 (Hotel New Yorker, New York).

COUNCIL
November 17, 1950 (Hotel Commodore, New York); January 19, 1951 (Hotel Commodore, New York); April 20, 1951 (Raleigh, N. C.); June 15, 1951 (Hotel New Yorker, New York); October 18, 1951 (Hotel Statler, New York); November 16, 1951 (Hotel New Yorker, New York).

NATIONAL CONVENTIONS
1951: October 17-18-19, Statler, New York.
1952: Boston.

HUDSON-MOHAWK SECTION
Meetings: Dec. 8 (Albany), Jan. 19, 1951 (Albany), Mar. 16, 1951 (Albany), May 11, 1951 (Albany), June 22, 1951 (Annual Outing).

MID-WEST SECTION
Meetings: February 3, 1951 (Morrison Hotel, Chicago), May 5, 1951 (Hotel Schroeder, Milwaukee), June 16, 1951 (Outing, Lake Lawn Lodge, Delavan, Wis.).

NEW YORK SECTION
Meetings: November 17 (Swiss Chalet), Jan. 12, 1951 (Hotel New Yorker), Feb. 23, 1951 (Hotel New Yorker), March 30, 1951 (Swiss Chalet), May 4, 1951 (Swiss Chalet), June 15, 1951 (Outing).

PHILADELPHIA SECTION
Meetings: December 8, January 19, 1951.

PUBLICATIONS COMMITTEE
November 16, 1950 (Hotel Commodore, New York); January 18, 1951 (Hotel Commodore, New York).

RESEARCH COMMITTEE
Meeting: Nov. 17 (New York).

RHODE ISLAND SECTION
Meeting: November 17 (Johnson's Commodore Room).

SOUTH CENTRAL SECTION
Meeting: Nov. 4 (Hotel Patten, Chattanooga, Tenn.).

SOUTHEASTERN SECTION
Meeting: December 9 (Atlanta, Ga.).

WESTERN NEW ENGLAND SECTION
Meetings: Nov. 3 (Shelton), Dec. 15 (Shelton), Jan. 26, 1951, March 16, 1951, May 4, 1951, June 23, 1951 (Outing).

Student-Paper Contest—

AN INVESTIGATION OF THE RELATIONSHIP BETWEEN AMOUNT OF DYE USED AND COLOR SENSATION OBTAINED AND ITS POSSIBLE APPLICATION IN TEXTILE DYEING*

HANRI CIKUREL

Student at North Carolina State College, Raleigh, N. C.

The dyer probably is aware of the fact that, in making a series of dyeings of different shades, if he uses arithmetic differences in amounts of dye, these series that he has formed will not appear to decrease in shade regularly. In the author's experiments of dyeing samples of a wool fabric, it is demonstrated that there is a definite relationship between amount of dye used and color sensation obtained, and that this relationship is logarithmic. In other words, a series of dyeings of 1%, 0.9%, 0.8% etc. that have a common difference of 0.1% in amount of dye do not appear evenly reduced in shade, while a series of dyeings at, for example, 1%, 0.79%, 0.63%, 0.50% etc. with a common ratio of $\frac{79}{100}$ show regular steps of reduction in shade. This is an illustration of the application of the Weber-Fechner law to the coloring of textiles.

PURPOSE

THE purpose of this paper is to demonstrate the relationship between the amount of dye (as applied to a textile material) and the color sensation obtained from it. In other words, what amounts of dye must be used to make a series of dyeings that differ from one another by equal intervals of color sensation? For example, if we make five dyeings starting with a 1.5% shade and ending with a shade of 0.2% so that we have the same difference of lightness between any sample and the succeeding one, of what percentages should the three intermediate dyeings be?

Our experiments are based on the Weber-Fechner law of stimulus versus sensation. Since color sensation is a psychological phenomenon, it is necessary to investigate this relationship in terms of psychophysics.

WHAT IS THE WEBER-FECHNER LAW?

First let us differentiate between stimulus and sensation. Stimulus is any factor that initiates activity of an organism, and by activity is meant sensation. For instance, light entering the eye from a colored material is a stimulus, and seeing color is a sensation.

We would all agree that a faint noise does not have to be increased as much as a loud noise in order for a variation to be perceived, or that the illumination increases much more if a second candle is lighted in a room than a twenty-first. The *additional sensed change of illumination* would keep on decreasing as the number of candles in the room increased, and finally a point would be reached where an additional candle would not cause any difference in the sensed illumination, that is, the increment of the intensity of the stimulus would be so small in comparison with the total intensity that we would be unable to distinguish the difference, and therefore a threshold limit would have been reached. The same situation occurs with any kind of stimulus producing sensation, including color. This leads us to the conclusion that when the strength of a stimulus is increased the *resultant sensory intensity* follows the rule of diminishing returns.

E. H. Weber (1795-1878) of the University of Leipzig investigated this relationship and stated a law, which was later expanded by G. T. Fechner (1801-1887) to read as follows: "In comparing magnitudes it is not the arithmetic difference but the ratio of the magnitudes which we perceive."

Weber demonstrated his statement by experimenting with weights. He found out by weights held between the fingers and weights lifted by hand that a weight of thirty ounces could just barely be distinguished as lighter than a weight of thirty-one ounces and as heavier than one of twenty-nine ounces. With lighter weights the same proportion held true; for instance 14.5 ounces could just be distinguished from 15 ounces.

Weber also experimented by distinguishing the length of lines and found the same relationship. Thus he concluded that the observed difference between two magnitudes is dependant on the *size* of the magnitudes, and is a constant fraction for the same object or the same kind of stimulus. Expressed as a ratio in order to produce a *just noticeable difference* (often referred to as "j.n.d.") the fraction is

$$\frac{dR}{R} = C \text{ (a constant known as Weber ratio)}$$

where dR is the increment of the stimulus and R is the size of the stimulus.

In the case of weights, $\frac{dR}{R}$ was found to be about $\frac{1}{30}$. For example, 600 grains

* Winner of second prize in first annual Student-Paper Contest in Winston-Salem on April 1, 1950.

must be increased by $600 \times \frac{1}{30} = 20$ grains for the difference to be just noticeable, that is, we would need a 620-grain weight to say that it is just distinguishably heavier than the 600-grain weight; or a 580-grain weight to say that it is just noticeably lighter. Or, to get just noticeably different weights, we must multiply $600 \times \frac{31}{30} = 620$, or $600 \times \frac{30}{31} = 580$. According to this explanation, it would *not* be possible to distinguish between a 600-grain weight and a 610-grain weight, or between a 600-grain weight and a 590-grain weight. In our case, if the $\frac{dR}{R}$ of a color is established (which can be done by experimental methods), then we can calculate the increment of the shade to produce a "j.n.d." The use of this conception will be discussed later.

Fechner assumed the Weber ratio, and explained that, since it is necessary to multiply a constant ratio by the intensity of the stimulus in order to give a "j.n.d." (i.e. .....

$600 \times \frac{31}{30} = 620$, just noticeably different from 600,

$620 \times \frac{31}{30} = 640.7$, just noticeably different from 620, and

$640.7 \times \frac{31}{30} = 662.1$, just noticeably different from 640.7)

then a series obtained by multiplying a fixed intensity (I) by a fixed ratio (r) would produce equal *sensed differences*, or equal intervals of sensation, that is, I, Ir, Ir^2, Ir^3, Ir^4, would *produce arithmetic differences of sensation, while the series is in geometric progression.*

The Weber-Fechner law can be restated as follows: "To increase the sensation difference in arithmetic ratio, it is necessary to increase the stimulus difference in geometric ratio."

By mathematics, if two series correspond point by point and one of the series is arithmetic while the other is geometric, then the relation between the two variables must be logarithmic and the relation between the two can be expressed by the Fechner formula as follows:

Sensation = C log Stimulus

where C is related to the Weber Ratio, which is constant for a particular stimulus.

EXPERIMENTAL

It is the scope of this paper not to discuss Weber's and Fechner's experiments, although this had to be done to some extent, but rather, to show how the very simple Weber-Fechner law can be used in textile dyeing without recourse to more complicated modern color theory and expensive optical instruments.

The law was demonstrated by dyeing samples of a wool fabric with acid dyestuff.

CHOICE OF SHADES.—Two series of ten dyeings each were made. The first series was formed by taking 1% as the starting shade and decreasing the shades arithmetically by 0.1% so that we had an *arithmetic series* as follows:

1%	0.9%	0.8%	0.7%	0.6%
0.5%	0.4%	0.3%	0.2%	0.1%

The second series was formed by taking 1% as the starting shade again, but this time decreasing the shade geometrically, as shown in Table I.

CHOICE OF DYESTUFF.—By use of a dye that exhausts nearly 100% it was valid to assume that the amount of dye taken for a dyeing was the same as the amount of dye on the fiber. Calcocid Milling Red 3B fulfilled these conditions.

DYEING CONDITIONS.—3-gram pieces of white wool fabric (6.78 oz. per sq. yd.) were dyed in a liquor ratio of 1:60 under like conditions at the same time and on the same steam bath. Dyeing was started at 140°F. with the dyestuff, 20 times as much Glauber's salt and 5 times as much 10% acetic acid as dye. The temperature was raised in one-half hour to 190°F., and dyeing was continued for one hour longer. A further addition of a like amount of acetic acid was made after dyeing had gone on for 15 minutes, and all the color in each case was exhausted during the last hour of dyeing by additional amounts of acetic acid. The dyeings were rinsed similarly in cold water and dried.

RESULTS.—If we examine the two series of dyeings, we observe that the shades in the arithmetical series decrease in unequal steps as we view them, whereas those of the geometrical series decrease in even steps. Twenty-one people concurred in these observations but four could not readily see the difference in regularity. When corresponding alternate dyeings of both series were covered, the equality of the steps in the geometric series became more easily evident.

Although photographs also showed the greater regularity of the color steps in the geometrical series of dyeings over those of the arithmetical series, the photographs lose so much in printing that they are not reproduced here. Spectrophotometric reflection readings expressed in logarithmic units (density) would clearly have shown the logarithmic relation of the geometric series of dyeings, but a spectrophotometer was not available.

VALUE TO DESIGNER AND DYER

In order to form any kind of harmony, whether in sound or color, it is necessary for the various units forming the harmony to be set in a series of equal or regular psychological intervals. This means that the units should be arithmetically different in sensation. In order to produce this effect, it is necessary for the stimulus to be in a geometric series (Weber-Fechner law). In a musical scale, for example, the frequencies of the sound waves of the notes are in geometrical progression.

Likewise, in the development of a series of colors produced with the same dye, the steps between colors must be based on logarithmic units with respect to amounts of dye, but in arithmetic steps with respect to sensation. Not only the Munsell system, which can be used for studying color harmony, but also the Ostwald theory of color are founded on the Weber-Fechner law.

In a mill it is the designing department that is primarily interested in color harmonies. The dyer or printer generally needs only to match shades submitted to him. But let us suppose that a dyer is required by the design department to produce three shades evenly spaced, psy-

TABLE I

GEOMETRIC SERIES

Percent Dyeing	*Logarithm of Percentage*	*Ratio = 0.794*	*Stimulus*
1.0	10.00—10		I
0.794	9.90—10	0.794/1.000	Ir
0.631	9.80—10	0.631/0.794	Ir^2
0.501	9.70—10	0.501/0.631	Ir^3
0.398	9.60—10	0.398/0.501	Ir^4
0.316	9.50—10	0.316/0.398	Ir^5
0.251	9.40—10	0.251/0.316	Ir^6
0.199	9.30—10	0.199/0.251	Ir^7
0.158	9.20—10	0.158/0.199	Ir^8
0.126	9.10—10	0.126/0.158	Ir^9

Note that the figures in the second column have a "common difference" of 0.10 (they are related to sensation) and the figures in the first column have a "common ratio" of 0.794 (they are related to stimulus). As a matter of fact the percentages (1st column) were obtained by taking the antilogarithms of the figures in the second column.

TABLE II

Dyeing No.	Logarithm of Number of Percent	Percent
5	10.1761-10	1.50
1	9.3010-10	0.20
	0.8751—difference for 4 steps	
	0.2188—difference for 1 step	
1	9.3010-10	0.20
2	9.3010-10+0.2188= 9.5198-10	0.33
3	9.5198-10+0.2188= 9.7386-10	0.55
4	9.7386-10+0.2188= 9.9574-10	0.91
5	9.9574-10+0.2188=10.1762-10	1.50

chophysically, between 1.5% and 0.2%. We are assuming for this simple problem that a single dye is involved and that it exhausts nearly completely, as did the acid dye in our experiments. At what percentages should the intermediate dyeings be made to get even color steps?

To solve the problem we set up a table of logarithmic values corresponding to percentages as was done before in Table I, and space the logarithmic intervals evenly between the logarithms for 1.5 and 0.2 as in Table II.

If other than even optical steps are required between dyeings, logarithms of the numbers can be used in the same general manner as illustrated in Table II to get whatever arrangement of steps is required.

By application of a formula like the one used earlier to explain the Weber-Fechner law, we can also solve the problem of the percentages of dye for three dyeings evenly spaced optically between 0.2% and 1.5% to obtain the same results.

$I = I_o r^{(n-1)}$

I = percent for heaviest shade, or 1.5.

I_o = percent for weakest shade, or 0.2.

n = number of dyeings, or 5.

r = multiplication factor to get a sensation one regular step higher.

Then, substituting in the equation, we get

$1.5 = 0.2\ r^{(5-1)}$,

or $r^4 = 1.5/0.2 = 7.5$

and $r = \sqrt[4]{7.5} = 1.655$.

The dyeings can then be calculated successively by the same formula as follows:

No. 1 = I_o = 0.2%, given.

No. 2 = $I_o r$ = 0.2% x 1.655 = 0.33%.

No. 3 = $I_o r^2$ = 0.2% x $(1.655)^2$ = 0.57%.

No. 4 = $I_o r^3$ = 0.2% x $(1.644)^3$ = 0.91%.

No. 5 = $I_o r^4$ = 0.2% x $(1.655)^4$ = 1.5%.

The Weber-Fechner law can also be useful to a dyer to calculate the amount of dye to make a third dyeing as much weaker than a second as the second dyeing is weaker than a first. If the first two dyeings are 1.0 and 0.75%, respectively, then the third dyeing should be (0.75/1.00) x 0.75% = 0.56%. If a fourth dyeing is required as much stronger than 1.0%, the fourth dyeing should be (1.00/0.75) x 1.00% = 1.33%.

CONCLUSIONS

It has been shown that the unit for differentiating percentage shade is a ratio and not a difference.

The Weber-Fechner law that "sensation = C log stimulus" holds true for the dyeing of textiles where stimulus is the amount of dye on the fiber and sensation is the psychophysical perception of color. This relationship is correct for practically all intensities. At very low intensities, the very small amount of light inside the eye has to be added to the external light stimulus for this relationship to apply. However, it is important to note that this is very small and is even negligible within the range of shades used for textile dyeing.

It is suggested that the Weber-Fechner law can be used in textile practice for calculating percentages of dye for dyeings at equal or other required psychophysical intervals of depth of color without recourse to modern color theory or expensive optical instruments, provided the dye exhausts completely, or provided an allowance is made for incomplete exhaustion.

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50-32

Education: High school, Army Air Forces.

Experience: Dyer and finisher, variety of colors and fibers, including synthetic; development work.

Age 38; married; New England or South preferred; other locations acceptable, including Spanish speaking countries.

10-30, 11-13

50-37

Education: College.

Experience: textile machinery sales, supt. of dyeing, dye demonstrator.

Age 38; married; New York or New England preferred but not essential; references.

10-30, 11-13

50-41

Education: College, textile dyeing and finishing.

Experience: Chemistry and dye laboratory, plant control work, cotton yarns.

Age 21; single; position near textile night school desired; references.

10-30, 11-13

50-42

Education: Textile evening school.

Experience: Color matcher, chemist and Asst. supt.

Age 35; married; references; New England preferred.

10-30, 11-13

50-44

Education: Textile institute, with university extension and accounting courses.

Experience: Chemist and supt. of dyeing, cotton.

Age 56; married; references; sales, superintendency or technical work on dyes in New England preferred.

10-30, 11-13

AATCC Sub-Committee*

LITERATURE SURVEY OF TEXTILE BLEACHING

JOHN F. HAGEN
Chairman

PART I

CONTINUOUS AND SEMICONTINOUS BLEACHING—HYPOCHLORITE VERSUS PEROXIDE

CONTINUOUS AND SEMICONTINUOUS BLEACHING

(Continued from October 16 Issue)

Hypochlorite Bleaching

1. Effect of Hypochlorite Bleaching on the Resistance to Abrasive Wear of Cotton Fabric. H. E. Cowles and J. G. Williams. *J. Textile Inst.* 39, P175-7 (1948). Plain woven cotton fabric, purified by soaking, rinsing, and boiling 15 mins. in H_2O contg. 2 g./l. Na_2CO_3, was tested for resistance to abrasion (I) and tensile strength (II) before and after bleaching in NaOCL of 10 g./l. available Cl, with or without subsequent boiling in 2 g./l. Na_2CO_3 soln. for 20 min. Before the alk. boiling the bleaching did not markedly affect I or II. The alk. soln. becomes colored lemon yellow to an intensity proportional to the amt. of bleaching treatment. After treatment with the alkali there is a continuous fall in II, while I falls steadily to 45% but not lower. Retreatment up to 4 times gave further reduction of I and also of bursting strength (III). The bleaching tests were repeated for longer times up to 16 hrs. and I and III were tested in both dry and wet states. Falling off in I for the air-dry material was found to be slight, but that of the wet cloth was continuous and rapid as duration of treatment increased. Tests with bleach liquor kept at 0.07 g./l. available Cl, with addn. of 0.5 g./l. Na_2CO_3, followed by 15 min. alk. boiling gave the same rapid loss of I while the fabric was being bleached. It was concluded that resistance to abrasion is not reduced to a great extent while the natural coloring matters are being removed from the fiber, but thereafter the loss is serious. If possible, bleaching should be omitted, or at least it should be carefully controlled.

2. The Bleaching of Cotton Goods-Possible Methods for Improving The Efficiency of Hypochlorite-Bleach Liquors. *Chem. Abstracts* 1947. A. J. Hall. *Textile Mercury and Argus* 96, 456, 458 (1947). Evidence is presented which shows that the efficiency of Cl-bleach liquors can be improved by addn. of $NaHCO_3$. The bleach liquors are made even more effective by addn. of suitable wetting out agents, especially those inert to Cl. Bleaching in acid soln. is more likely to produce high Cu nos. indicating damage to the cotton, Ibid. 481,483.—Data are given showing that whiteness increases with increasing pH. An alk. bleach liquor at pH 9.6 appeared to produce the best whiteness and caused the least reduction in tensile strength of the fiber. Addn. of $NaHCO_3$ can be beneficial but preliminary trials must be made to ascertain its suitability for the type of bleach liquor to be used.

3. Bleaching Cotton. Stuart M. Rogers (to the Solvay Process Co.) U. S. 2,417,570. Mar. 18, 1947. The addn. of about 0.10-2g. per l. of a readily sol. stannate (e.g., Na stannate) to an alkali metal hypochlorite bleaching soln. increases the bleaching action of the soln. on cotton and minimizes fiber degradation with its attendant yellowing on ageing of the fabric. The bleaching may be carried out between 70° and 200°F. for a period of 3-5 hrs. The soln. is capable of reuse, after hypochlorite fortification, for as long as the stannate action (control of the release of bleaching power) is present. The stannate may be stabilized by the addn. of 0.25-1.0 g./l. of alkali metal hydroxide.

4. Evaluation and Comparison of Two Commercial Bleaching Processes. James H. Kettering and Rita M. Kraemer (Southern Regional Research Lab., New Orleans). *Am. Dyestuff Reptr.* 35, 285-7 (1946). Samples of broadcloths processed by a double-boil H_2O_2 bleach method and samples processed by a single-boil hypochlorite bleach were not essentially different in their properties. Only the highly accurate tests would differentiate the fabrics produced. Fluidities in cuprammonium hydroxides were the only analytical values that varied significantly, favoring only slightly the double-boil H_2O_2 process. The data suggest that some shortening of the kierboiling time in the conventional kierboil-hypochlorite bleach process would in some respects enhance the quality of output without sacrificing any valuable property.

5. Chlorination Apparatus for Piece Goods Made of Vegetable, Animal, Artificial Fibers or Their Mixtures. Helmuth Korte, Wilhelm Waibel, and Johann Metzger (vested in the Alien Property Custodian). U. S. 2,382,726, Aug. 14, 1945.

6. Bleaching Cellulosic Textile Materials. George P. Vincent, Archie L. Dubeau, and John F. Synan (to Mathieson Alkali Works). Brit. 566,291, Dec. 21, 1944. An alk. soln. of a hypochlorite, an alkali metal chlorites, such as $NaClO_2$, and an org. detergent, such as Na sulfoethylmethyloleamide, Na borosulfate of octadecenyl alc., or synthetic org. compds., is circulated through the material at 85-95°F. till it is bleached. The temp. of the soln. is then raised to about 200°F. and the circulation is continued long enough to scour the material. The ratio of hypochlorite to chlorite in the soln. is 1.5:1 based on available Cl. The pH of the soln. is maintained at 8-11. Cf. *Chem. Abstracts* 40, 2203.

7. Bleaching Cellulosic Textile Materials. Geo. P. Vincent (to the Mathieson Al-

* AATCC Subcommittee, which conducted survey, consists of W. R. Adams, T. E. Bell, R. L. Carr, R. S. Cox, A. D. Damon, H. O. Kaufmann, P. B. Reuman, R. A. Secord, F. R. Tripp, A. R. Wachter and John F. Hagen, *Chairman*, who prepared this final report.

kali Works). Brit. 561,834, June 7, 1944. Bleaching of cellulosic materials, similar to that effected by Na_2ClO_2, may be carried out by the use of a mixt. of chlorite and hypochlorite in an alk. soln., the pH of this soln. being maintained between 8.7 and 10.0. The reaction between $NaClO_2$ and NaClO results in the formation of ClO_2. Cf. *Chem. Abstracts* 39, 3669[7], 5506[5].

8. Some Cases of "Paired Reactions of Combined Action." P. P. Viktorov. *Tekstil. Prom.* 4, No. 4, 9-12 (1944).—In substituting NaOH in the process of bleaching textiles it was observed that the phys. changes occuring in the fiber do not become apparent until after another chemical has acted on the same fiber. This combined action was noticed with NaOH and hypochlorite, with mineral acid and soap and with mineral acid and hypochlorite. This phenomenon is arbitrarily referred to as "paired reactions of combined action." To study their effect on the capillarity of cotton fiber, the following "pairs" were investigated: (1) H_2O and benzene, (2) H_2SO_4 and benzene, (3) H_2O and soap, (4) H_2SO_4 and soap,[3] (5) H_2O and hypochlorite, (6) H_2SO_4 and hypochlorite, (7) Kontakt and hypochlorite and (8) a mixt. of H_2SO_4 with Kontakt and hypochlorite. Pairs 1,2,5,6,7 and 8 were studied in the order of reagents given and in reversed order, e.g., pair 1 was studied by treating the cotton first with H_2O then with benzene and also first with benzene then with H_2O. Pair 3 was studied with 0.1 and 0.5% soap (a mixture of cottonseed oil 20[2] and oleic acid 3 g. saponified with 28 g. of a 15% NaOH solution) solns. The 0.1% soln. was studied in order soap—H_2O and the 0.5% soln. in order soap—H_2O and H_2O—soap. For pair 4 the same soap solns. were used. Both Solns. were studied in order soap-acid. As acid was used a soln. contg. 0.5 g. per l. of 100% H_2SO_4. The Kontakt soln. contained 2 g. per l. The hypochlorite was a soln. of bleaching powder contg. 1 g. per l. of active Cl. The measure of capillarity was the height of ascent of an eosin soln. through the warp of the test pieces. Details of procedure are given and the results are tabulated. Pairs 1 and 5 produced no capillarity. Of pair 2 neither of the members of this pair (H_2SO_4 and benzene) caused capillarity, but their combined action, regardless of the order, did induce capillarity. In pairs 3 and 4, the 1.0% soap soln. had no effect. The 0.5% solns. were effective regardless of the order. Of pair 6 neither the acid nor the hypochlorite was effective alone; combined they caused the eosin to rise regardless of order. Pairs 7 and 8 behaved as 6. Pair 8 gave the best results in regard to the evenness of rise of eosin and the uniformity of coloring. The combined action of an acid and bleaching soln. is utilized in textile treating, e.g., bleaching, designing, etc.

9. Bleaching of Cellulose in Linters. J. Thoria (Indian Central Cotton Comm., Bombay) *J. Indian Chem. Soc., Ind. & News Ed.* 7, 123-32 (1944). Indian linters mechanically cleaned, were kier-boiled with 6% NaOH (I), 8% NaOH (II) and 7% NaOH and 1% Na aluminum (III) (each with 1% Igepon T); II gave the best results. I, bleached at pH 8.5 showed the max. whiteness with min. degradation and lowest Cl consumption; the best results were obtained with 8 to 15% HOCl. Under these conditions, the $NaHCO_3$ exerts a specific and advantageous influence on the bleaching process; no explanation is offered for this action. The optimum bleaching time is about 1.5 hrs.; beyond this there is a rapid degradation of linters. Expts. with III showed that the optimum concn. of available Cl was about 1.5 g/l; any excess above this amt. leads almost exclusively to degradation of the cellulose. The results show the need of the joint investigation of kier-boiling and bleaching.

10. Cold Bleaching of Cellulose Fibers. Ralph R. Oliver (to Lockport Cotton Batting Co.) U. S. 2,359,782, Oct. 10, 1944. Cellulose fibers are bleached in a liquor contg. a typochlorite, e.g. Ca hypochlorite, and an inorg. glucosate. The nature of the latter is such that it is coagulated by bivalent ions and in consequence forms colloidal particles. Suitable glucosates are Na glucosate, phosphorglucosate, pyroglucosate, and tetraphosphoglucosate. The colloidal glucosates envelop encrusting material present in the bleaching soln. and thereby prevent its adherence to the bleached fibers.

11. The History of the Modern Cotton Bleach. H. Baier and W. Hundt. *Melliand Textilber.* 25, 349-51 (1944). The following sequence is advocated for bleaching cotton and cotton rayon mixts.: wetting out, cold alkaline hypochlorite, warm alkaline hydrogen peroxide. *Chem. Abstracts* 40, 4222 (1946).

12. Fiber Damage on Bleaching. Eugen Klenk (Elektrochem. Werke Munchen A. G. Hollriegelskreuth). *Kolloid-Z* 108, 10-16 (1944). Methods are outlined for detg. the extent of damage to wool and filament or staple rayon resulting from bleaching with peroxides or hypochlorites. The role of Fe, Mn, Cu, and Co as degradation catalyts is reviewed. H. K. Livingston.

13. Bleaching Synthetic or Natural Fibers. Atanazy Boryniece (to Tomaszowska Fabryka Sztucznege Jedwabiu, Spolka Akcyjna, and Atanazy Boryniec). Ger. 745,410, Dec. 2, 1943 (Cl. 8*i* 2). The fibers are first treated with a hypochlorite soln. having a pH of 11-12. This is followed by a treatment with acid solns., gases or vapors, and finally rinsing and drying. The treatment is carried out on perforated carriers through which the treating solns. are sucked or pressed.

14. Alkali-Chlorine Cells in Modern Textile Factories. A. G. Arend. *Textile Recorder* 60, No. 719, 46-7, 49 (1943).—NaOH obtained by electrolysis of NaCl suffices for most purposes in the textile mill. However, the presence of a small percentage of the original chloride prohibits its use for rayon treatment in many cases. A small layout is described.

15. Methods of Control and Measurement in Bleaching and Bleaching Instructions for Finishing Operations. R. Kling. *Klepzig's Textile-Z.* 46, 182-4 (1943); *Chem. Zentr.* 1943, I, 2741.—It is necessary to check accurately by titrimetric methods the boiling and bleaching liquors for each bleaching operation. Detn. of alky. of Cl baths, pH measurements and detn. of concns. of active Cl and O are discussed. Bleaching instructions are given which are based on studies of the Deutsche Gold-und Silberscheideanstaltheim. The detn. of the factor of damage is discussed. Errors found in industrial control work and improvements of the factor of damage by suitable control are illustrated by tables.

16. Bleaching Cellulose. E. Scheller (to Deutsche Gold-und Silber Scheideanstalt vorm. Roessler). German 736,070, April 29, 1943. The cellulose is treated with Cl and immediately afterward H_2O_2 or substances yielding same are added to the bleaching liquor. *Chem. Abstracts* 38, 3126 (1944).

17. New Ideas in the Field of Linen Bleaching. Louis Bonnel. *Ind. Textile* 60, 59-60, 123-4 (1943). *Chem. Zentr.* 1943, II, 1161; cf. *Chem. Abstracts* 38, 4451.[3] The following subjects are treated: the strongly colored, stable choramine resulting at the bleachery; chemistry of the splitting off of the HCl from the chloramines; oxidizing and whitening effect; the fiber weakening HCl separation (cf. K. Butz, *Chem. Abstracts* 30, 6580[1]); whitening bleached linens without assistance of chloramines; decompn. of linen cellulose; the main effect of hypochlorite at pH 6-8, the least at pH 11-12 or 3-4 (cf. Kauffmann, *Chem. Abstracts* 27, 421); acid-bleaching according to I. G. Korte; H_2O_2 bleach; stabilization; formation of oxycellulose by O in the nascent state (cf. Scheller, *Chem. Abstracts* 30, 3225[9]); H_2O_2 as vehicle of bleaching effects, free O as cause of fiber damage; effect of temp. and water glass; the metal catalysts and their effect; chemistry of catalysis in pertinent literature; bleaching app. and its inability to give a complete bleach in a continuous operation.

18. Fiber-Sparing Bleaching. H. Baier and W. Hundt. *Melliand Textilber* 24, 73-9 (1943). Preliminary, intermediate and aftertreatments, bleaching and operations, bleaching agent consumption, Cl and peroxide bleaches, bath control and fiber testing are discussed. All attempts to prevent damage to the fiber during bleaching involve the lowering of the concn. of the bleaching agent. However, a mere reduction of the amt. of bleaching agent in the bath does not guarantee the safety of the fiber or a satisfactory bleaching action. Other factors that are important are time of treatment, reaction temp. and stability of the bath.

19. Bleaching 150 Years Ago. Wolfgang Dohle. *Klepsig's Textil-Z.* 45, 899-91 (1942); *Chem. Zentr.* 1943, I, 482.—A process of bleaching with Cl was described in a book by Westrumb, published in 1800.

20. Bleaching Cellulosic Material. — Deutsche Gold-und Silber-Scheideanstalt vorm. Roessler. Belg. 446,444, Aug. 31, 1942. The material is first treated in acid medium, at atm. or slightly higher temp., with limited quantities of chlorite so that nearly all the ClO_2 formed is absorbed in 1-2 hours by the impurities of the

raw materials. After washing the material is bleached with hypochlorite. It is advantageous to subject the material to chlorination by liberation of Cl in the bath before treating it with chlorite.

21. The Control of pH in Hypochlorite Solutions. I. B. P. Ridge and A. H. Little. *J. Textile Inst.* 33, T33-58 (1942) Equilibria prevailing in dil. hypochlorite sons. over the pH range 10 to 1 are discussed. In the region pH 6 to 3, HOCl predominates, while above pH 5 its concn. decreases with increase of OCl, becoming negligible at about pH 10. Below pH 4, the concn. of HOCl decreases as the free Cl_2 in soln. increases, and becomes negligible at about pH 1. The effect of various buffer agents on the pH of calcium and sodium hypochlorite solns. in the absence of textile materials, and the concns. of the various agents required to maintain a pH within specified narrow limits were detd. The agents examd. include calcium hydroxide, carbonic acid and its salts, boric acid, sodium borate, the sol. phosphates and acetates and salts of zinc and aluminum, most of which are reasonably cheap and suitable for tech, use. **II**, *Ibid.* T59-74.—The fall in pH during the bleaching of textile materials with hypochlorite solns. in the absence of buffer agents is illustrated by the bleaching of linen yarns by use of hypochlorite solns. with and without buffering. For practical applications, the data are summarized in figures and tables showing the substances that may be used for buffering hypochlorite solns. and the pH ranges covered by them, as compared to an arbitrary range over which hypochlorite may be considered to exert a buffer action; the quantities of the buffer agents necessary to stabilize the pH within a narrow range for various concns. of available chlorine in the hypochlorite liquors and for different cellulosic textiles including cotton; rayon, linen, and jute; and the changes in pH of buffered hypochlorite solns. that occur during bleaching of these different fibers. Details are given of the treatments and results obtained in comparative bleaching of the different fibers by use of the methods of buffering under discussion. Rayon and cotton which contain little noncellulosic material have less tendency to alter the pH of the soln. than have fibers such as jute which have relatively large proportions of noncellulosic constituents. Information is also given on the amt. of com. acids to use in prepg. acid hypochlorite liquors. These solns. are used in the wet chlorination of wool as well as in bleaching. Electrometric measurements were made throughout these studies by means of the glass electrode.

22. Bleaching Vegetable Fiber. Richard Kling (to Elektrochemische Werge Munchen a.-G.) Ger. 719,828, March 26, 1942 (Cl. 8i, 2). Cotton, regenerated cellulose or their mixt, is bleached in a hypochlorite soln. followed by a peroxide bath. The hypochlorite liquor contains alkali hydroxide up to 1 g. per l. and alkali carbonate 0.5-10 g. per l. The amt. of bicarbonate then corresponds stoichiometrically to the alkali hydroxide used.

23. Bleaching Vegetable Fiber. R. Kling (to Elektrochemische Werke Munchen A.-G.) German 719,828, March 26, 1942. Cotton, regenerated cellulose or their mixt. is bleached in a hypochlorite soln. followed by a peroxide bath. The hypochlorite liquor contains alkali hydroxide up to 1 g. per l. and alkali carbonate 0.5-10 g. per l. The amt. of bicarbonate then corresponds stoichiometrically to the alkali hydroxide used. *Chem. Abstracts* 37, 2193.

24. Bleaching According to (German Government) Regulations. F. Mossman and H. Rettberg. *Klepzig's Textil-Z* 45, 73-8 (1942); *Chem. Zentr.* 1942, I, 2211. The whole subject of bleaching is discussed with reference to government regulations, including boiling, bleaching of cotton, synthetic and mixed fibers with hypochlorite and with peroxide, washing and after-treatments for both types of bleaching baths, the detn. of the conc. of the baths and the calcn. of the Cl or H_2O_2 content of the bath. *Chem. Abstracts* 37, 3278.

25. The Chemical Action of the Proteins of Cellulose During the Bleaching Operation. *Louis Bonnet. Teintex* 7, 46-7 (1942): *Chem. Zentr.*, 1942, **II**, 479. The formation of chloroamines from the proteins of the crude cotton fiber and the hypochlorites is discussed. The darkroom proteins are converted by Cl into yellow chloroamines, which exert a bleaching action on the fiber. In faintly alk. soln. one mol. of HClO adds to 1 mol. of protein, while in stronger alk. soln. a H atom of the amino group is substituted by Cl. In the presence of still higher alkali concns. the chloroamines become inactive and are finally decompd. Acids ppt. chloroamines; they must be neutralized with alkalies. If this neutralization is omitted then the fiber may be damaged. Alk. H_2O_2 bleaches and destroys chloroamines; a combination of hypochlorite and H_2O_2 bleaching is recommended. Linen should be bleached first with H_2O_2 and then with hypochlorites.

26. Warp Bleaching. Ribard Golbs. *Klepzig's Textile-Z.* 45, 613-14 (1942); *Chem. Zentr.* 1942, **II**, 2751.—Practical suggestions are made for bleaching according to the boiling, chlorinating and acid bleaching process, the Griesheim single-bath process, the combination bleaching method with hypochlorite and H_2O_2 and the O bleaching method.

27. Method for the Analysis of Bleach Liquors. C. F. Fernandez Anadin *Ion* 1, *No.* 5, 17-20 (1941); *Chem. Zentr.* 1942, **II**, 1376. To det. the active Cl, add H_2O_2 preferably to a neutral soln., and measure the vol. of O_2 evolved by the reaction $ClO^- + H_2O_2 = Cl^- + H_2O + O_2$. The detn. can be carried out conveniently in a Riegler Ureometer. The results agree with those obtained by the method of Penot. The alky. and the Cl— content can be detd. by known methods. With hypobromite solns. the disappearance of the yellow color can serve for detg. the end point in titrations. H_2O_2 solns. can be tested conveniently with freshly prepd. NaClO soln.

28. Acceleration of and Retardation of the Decomposition of Bleaching Baths. Louis Bonnet. *Teintex* 6, 340-4 (1941) *Chem. Zentr.* 1942, **I**, 2211. Homogeneous and heterogeneous catalysts, the sp. activators or secondary catalysts and other factors influencing these reactions as heat and light are discussed. H and OH ions play an important role in the homogeneouse catalysts while heavy metals, as Fe, Cu, Co., Mn and Ni, are active in the heterogeneous catalysts. In hypochlorite solns. the splitting-off of O from the ClO ion is facilitated especially by metallic catalysts. Cu acts nearly exclusively as the oxide. Some red and yellow vat dyes can act as catalysts for hypochlorite in the presence of light. Retarding agents are alcohols, acetone, silicates, proteins, etc. also S compds., NH_4CNS and catalytic poisons such as hydroxylamine. Heavy metals act on H_2O_2 at all pH values causing the formation of unstable peroxides. Certain vegetable products (catalases, enzymes) facilitate greatly the decompn. of H_2O_2, while acids retard its decompn. Effective stabilizers are phosphates, stannates, Mg salts and org. products such as thiourea, barbituric acid, urethan, and phenol alcohols.

29. Preparation, Analysis and Applications of Chlorine Lyes. Joaquin Navarro Sagrista. *Afinidad* 18, 299-310 (1941). Alk. solns. of Ca or Na hypochlorite and Cl-H_2O, used as decolorants and disinfectants, are described. Eight prepn. methods, the chemistry of HClO and its salts, bleaching, and analysis of Cl lyes are outlined.

30. Details of the Boiling-Off of Cellulose Fibers. P. Baffroy. *Teintex* 5, 262-9 (1940); *Chem. Zentr.* 1941, **I**, 2062. A summary is given of the process which can be used for the boiling off of raw cotton and linen fibers including those using lime, those using NaOH and those using mixts. of NaOH and Na_2CO_3. Details of alk. cotton bucking, especially admixts. such as synthetic soaps. wetting agents or protective colloids and bleaching with H_2O_2, hypochlorite, Chloramine-T, Blancal and Ondal are discussed. Other subjects considered include special precautionary measures which must be observed with mixed yarns of cotton and rayon (cf. Davidson, *Chem. Abstracts* 31, 5569[9]); the use of Cekit, and Alcontg. Monopol soap (cf. Ullman, *Chem. Abstracts* 26, 5424), Ludigol (I.G.), Revatol S. (Sandoz), Albatex BD (S.I.C.B. and Resit Salt I.C.I.) Patent and journal literature is cited.

31. Bleaching Cellulosic Textiles. Societe Beaute & Technique (S.a.r.l.) Fr. 859,652, Dec. 24, 1940. Cl-contg. compds., such as Na-N-chloro-p-toluenesulfonamide, and a reducing agent, such as Na sulfoxylate, are caused to react together slowly at room temp. in a bleaching bath for cellulosic textiles. Many chlorine compds. are listed.

32. The Importance of Chlorine in the Rayon Industry and its Role in the Manufacture of Important Textile Assistants. *Chem. Abtsracts* 1939. Fritz Ohl. *Monatsh. Seide Kunstseide Zellwolle* 44, 148, 150, 152, 154, 156 (1939). A brief review covering the use of Cl compds. in the manuf. of textile fibers, Cl bleaching, cold Cl bleaches, org. Cl bleach-

ing salts, Cl compds. for sizing and desizing, Cl salts for flameproofing and delustering, Cl cmpds. for carbonization and the manuf. of new textile assistants, Cl salts for curling staple rayon, making mixed fabrics nonshrinkable, dyeing and printing and Cl compds. for disinfection and moth preventives. 12 refs.

33. Bleaching Textiles. Ernest Butterworth, Frazer & Haughton Ltd. and Imperial Chemical Industries Ltd.—Brit. 500,473, Feb. 6, 1939. *Chem. Abstracts* 1939. In bleaching cellulosic materials, especially bast fibers, e.g., linen, jute, hemp, with a hypochlorite soln. contg. no neutralizing buffering agent at below 20° and with substantial exclusion of actinic rays, the time of treatment while the soln. is substantially neutral, i.e. within the pH range of approx. 5.8-8.2, is detd. in accordance with the concn. of available Cl at the time when the pH value of the soln. enters this range at the upper limit. The goods are subsequently treated with an alk. peroxide soln., e.g., as in Brit. 499,873.

34. Bleaching Materials Such as Textile Fabrics. *Chem. Abstracts* 1939. Paul L. Magill (to E. I. Du Pont de Nemours & Co.) U. S. 2,155,728, Apr. 25. Vapors of tert-butyl hypochlorite are used as a bleaching agent.

35. Bleaching. *Chem. Abstracts* 1939. Auguste Rooseboom (to Shell Development Co.) Can. 382,353, June 27, 1939. Material to be bleached is brought into contact with a hypochlorite soln. contg. an aliphatic ester or a salt of an aliphatic ester of H_2SO_4 in which the acid group is attached to a secondary or an "iso" C atom and the aliphatic group contains at least 8 C atoms. Several examples are described.

36. The Influence of Bleaching Defects on the Strength and Tension of Rayon. *Chem. Abstracts* 1939. Horst Back. *Kunstseide u. Zellwolle* 20, 402-5 (1938). The effect of the concn. of Cl was detd. by steeping overnight at 20° in a bath contg. 0.5, 1, 2, 4 and 8 g. Cl/l. Both dry and wet strengths were detd. and plotted. The damage increased markedly with concns. greater than about 2 g. active Cl/l. Cuprammonium rayon is more sensitive than viscose. In another series bleaching expts. were carried out with 1 g./l. of active Cl at 20°, 30°, 40° and 50° for 2 hrs. A sharp decrease in strength occurred at 30° and decreased still further at 40° and 50°.

37. The Chemistry of Cotton Bleaching. *Chem. Abstracts* 1939. C. G. Hampson. *Dyer* 80, 199-201 (1938). The impurities in raw cotton and their removal, and the action of Cl_2, hypochlorite, H_2O_2 and $KMnO_4$ in bleaching are discussed.

38. Bleaching Cotton. *Chem. Abstracts* 1939. Hugo Weiss and Ottmar Ritter von Reich. Brit. 490,382, Aug. 15, 1938. Singed or unsinged, desized or undesized cotton materials are bleached by a process in which (1) the bleaching bath comprises a weakly caustic alk. bleaching soln., (2) the amt. of peroxide used is not more than 2-3% of the wt. of the material to be bleached, (3) the amt. of water glass used is about 6 times the amt. of peroxide used and (4) the temp. is kept at a 90-100°. The bleaching bath is preferably made up from a chalk-free H_2O and the operations should be conducted in an open kier. In an example, raw, undesized Egyptian Maco is treated for 6 hrs. at 95° with a soln. contg. Na_2O_2 2-3 and water glass 12-18%.

39. Bleaching Cotton Goods. *Chem. Abstracts* 1939. Hans O. Kauffmann (to Buffalo Electro-Chemical Co.) U. S. 2,165,270, July 11. The goods were treated with a hypochlorite soln. having a pH between about 4.5 and 7.0 and are then dampened with a peroxide bleaching soln. of high concn. and permitted to bleach in the damp condition.

40. The Bleaching of Linen Fabrics With Hypochlorite in an Acid Medium. *Chem. Abstracts* 1939. A. F. Sitnin and L. S. Zu'eva *Lno-Penkoshutovaya Prom.* 7, No. 5, 37-41 (1937); *Chem. Zentr.* 1938, I, 3134. The fabric can be bleached in the first step with an acid medium, using 0.5 g. HCl per g. of active Cl in a Sworykin app. The Cl concn. should be reduced to 1.5 g./l. during a bleaching period of 30 mins. The degree of whiteness obtained with 2-stage bleaching, with acid bleaching in the first and alk. bleaching in the 2nd, is 6% greater than that obtained by alk. bleaching in both steps. Combination of acid Cl bleaching with subsequent treatment with H_2O_2 gives still better results.

41. New Theories in the Chemistry of Chlorine Bleaching. *Chem. Abstracts* 1939. E. A. Shilov. *Khlopchatobumazhnaya Prom.* 1937, No. 1, 36-8; Khim, *Referat Zhur.* 1, No. 3, 103 (1938).

42. Bleaching Fibers. *Chem. Abstracts* 1939. Christian Dierig A.-G. Zweigwerk Grunauer Bleiche Ger. 668,869, Dec. 10, 1938. Textile Fibers of all classes are bleached by soaking with usual bleaching lyes and subjecting to a medium—or high-frequency a.c.

43. Method of Bleaching and Dyeing of Cotton Jersey in the Piece. *Chem. Abstracts* 1939. Louis Bonnet. *Teintex* 2, 350-2 (1938). A bath contg. Na carbonate and sulfonated oil is followed by bleaching in a soln. of NaClO, an acid rinse, boiling out in olive-oil soap and Na carbonate, and bleaching again. Variations of this process are given together with dyeing processes in which trade dyes are used.

44. Bleaching Textiles. *Chem. Abstracts* 1939. Ernest Butterworth, Bertram P. Ridge, Frazer & Haughton Ltd. and Imperial Chemical Industries Ltd. Brit. 489,496, July 25, 1938. Cellulosic materials, especially bast fibers such as linen, jute or hemp, are bleached with a min. of chem. degradation of the cellulose in a process comprising at least 2 stages, viz., a treatment with a hypochlorite soln. maintained within a substantially neutral pH range, approx. 6-8, by means of a buffer salt and a subsequent treatment with an alk. soln. of an oxidizing bleaching agent, the alky., when a hypochlorite is used, being such that pH is greater than 8. The materials are preferably subjected to a preliminary treatment with a wetting-out agent and (or) with an alk. scouring liquor and are preferably subjected to an acid sour between the above 2 stages of the treatment. Among examples, hanks of linen yarn are scoured for 3 hrs. with Na_2CO_3 soln. at 65°, washed, treated in subdued light for 30 mins. on a reeling machine with a soln. at 14° of bleaching powder buffered with $NaHCO_3$ to pH 6.5, rinsed, treated for 3 min. with a cold dil. HCl soln., washed, treated for 3 hrs. with an alk. soln. at 65° made up with Na_2O_2, H_2SO_4 and Na silicate, washed and dried to obtain a good half-white bleach.

45. The Bleaching of Cotton Fabrics with a Sodium Hypochlorite Solution in the Presence of Sodium Bicarbonate According to the Method of V. I. Minaev. *Chem. Abstracts* 1939. L. V. Guryanov and N. G. Klemin. *Khlopchatobumazhnaya Prom.* 5, No. 5, 21-3 (1937); *Chem. Zentr.* 1937, II, 2927. The possibility is suggested of bleaching all goods considered with NaOCl + $NaHCO_3$ according to the method of Minaev for a period of up to 1 hr. instead of 12 hrs.

46. The Expediency of a Preliminary Treatment with Hypochlorite in the Bleaching of Aggregates from Filippov and Voronkova. I. P. Malyshev. *Khlopchatobumazhnaya Prom.* 6, No. 7, 24-7 (1936); *Chem. Zentr.* 1938 I, 774. *Chem. Abstracts* 1939. The introduction of a preliminary treatment with NaOCl + $NaHCO_3$ before the bleaching of cotton fabric with simultaneous reduction of the concn.[3] of the bleaching liquor (of NaOH, disulfite, contact and silicate) by 28% resulted in less satisfactory bleaching. The addn. of $NaHCO_3$ in the preliminary treatment is beneficial but is not of great importance.

47. The Effect of the Composition of the Water on the Whiteness of Materials When Bleached. D. A. Andronikov and G. P. Trykova. *L'no-pen'ko-dzbutovaya Prom.* 6, No. 4, 35-6 (1936); *Chem. Zentr.* 1938, I, 774. *Chem. Abstracts* 1939. The use of river water instead of distd. water in the bleaching of linen with hypochlorite can either improve or impair the bleaching action. The different action depends upon the Fe content of the water.

48. Products of Chlorination and Methods for their Removal. *Chem. Abstracts* 1939. M. D. Egorova and V. Lapina. *L'no-pen'kodzbutovaya Prom.* 6, No. 2, 40-51 (1936) *Chem. Zentr.* 1938, I, 471-2. Expts. with raw spun yarn, undressed linen, etc. are reported.

49. The Chemical Treatment of Loose Cotton. *Chem. Abstracts* 1939. R. Beha. *Ind. Textile* 54, 560-1 (1937); *Chem. Zentr.* 1938, I, 2280. Directions are given for bucking and bleaching. Bucking with 1% NaOH, 1% Na_2CO_3, 0.5% Na sulfuricineolate or, better, with gardinol and 97.5% Fe-free water is recommended. Bleaching is done with hypochlorite acidified with HCl; dechlorination, with $NaHSO_3$.

50. Bleaching Textiles, *Chem. Abstracts* 1939. Ernest Butterworth Betram P. Ridge, Frazer & Haughton Ltd. and Imperial Chemical Industries Ltd. Brit. 497,346, Dec. 16, 1938. In a modification of the process of Brit. 489,496 (*Chem. Abstracts* 33, 881[7]), the materials are

treated with a soln. of a reducing agent prior to the treatment with the buffered neutral hypochlorite soln. The treatment with the reducing agent may be preceded or immediately followed by a treatment with an alkali soln. Reducing agents specified are alkali and alk. earth metal sulfites, bisulfites and hyposulfites and the corresponding acids. Among examples, linen yarn is treated for 1 hr. at 70° with an aq. liquor contg. soda ash and Na_2SO_3, washed successively in warm and cold water, treated in the dark for 30 min. with a buffered neutral hypochlorite liquor at 15-16° contg. bleaching powder and $NaHCO_3$ rinsed in cold water, doutrf in fil. HCl, washed, treated for 2 hrs. in a aq. liquor at 65° contg. Na_2O_2, H_2SO_4 and Na silicate, washed and dried to obtain a good half-white bleach.

51. Role of Protein in Cotton During Bleaching. *Chem. Abstracts* 1938. E. Kornreich. *Melliand Textilber.* 19, 61-3 (1938). The 1.0-1.5% of protein usually present in raw cotton is largely removed by dissoln. in the alk. kier liquor (this thereby acquires fat-emulsifying properties), but partial reabsorption occurs so that complete removal cannot be affected. The behavior of this residual protein in subsequent bleaching with Cl and H_2O_2 is discussed. The initial rapid whitening of kiered cotton when immersed in a Cl bleach liquor is due to the conversion of brown protein into a greenish-yellow chloroamine (I); this can further react with Cl_2 to form a monochloroamine which slowly oxidizes other impurities in the cotton. Protein is sol. in alkalis and insol. in acids; dissolved protein in alk. Cl bleach liquors gives them strong foaming power. Protein is changed in presence of alkalis into a modification having latent oxidizing power which is developed only by acidification (e.g., with HCl KI). In alk. H_2O_2 bleach liquors protein readily dissolves and stabilizes the liquor. In bleaching successively with Cl and H_2O_2, the protein formed in the first bath dissolves in the 2nd (usually hot) and acts as a stabilizer until destroyed; stabilization does not occur if the material is soured between the 2 bleaching treatments.

52. The Bleaching of Threads and Fabrics of Plant Origin. *Chem. Abstracts* 1938. L. J. N. van der Hulst. *Chem. Weekblad* 35, 97-101 (1938). A crit. review of the methods used in studying the bleaching of linen and cotton fabrics. The relationship of the H-ion concn. to the destruction of linen and cotton during bleaching with HOCl and H_2O_2 solns. is discussed in relation to the effect of the pH of the soln. on the cellulose fibers.

53. Bleaching Bast Fibers. *Chem. Abstracts* 1938. Deutsche Solvay-Werke A.-G. (Paul Bald, inventor) Ger. 659,220, Apr. 28, 1938. An improvement is described in the bleaching of bast fibers, or yarns or fabrics made therefrom, by the known processes in which the materials are boiled in a dil. alk. soln and then treated in turn with a soln. of an alkali sulfide and with bleaching baths which evolve Cl and O. The improvement consists in treating the materials with a tanning agent: e.g., CH_2O or AcH, before or during the treatment with alkali sulfide soln. Loss in wt. of the fiber is thus reduced. An example is given.

54. The Bleaching of Rayon and Staple Rayon. *Chem. Abstracts* 1938. Hans J. Henk. *Deut. Wollen-Gewerbe* 70, 319-20 (1938). Artificial cellulose fibers may be bleached with Cl bleach liquors, with H_2O_2 or with per salts. The decompn. reactions of HClO for various pH values are discussed. As the liberation of free Cl from mol. HClO starts practically only at pH 7, in an alk. medium the formation of addn. compds. with contaminations in the textile represses the oxidizing and chlorinating action. This explains why peroxides yield a better white than Cl bleach liquors. Only active O can damage the fiber in bleaching operations. Rayons and staple rayons bleached with H_2O_2 and per salts are weaker and lower in luster no. than those treated with Cl bleach liquors. O bleaches increase the softness of the goods to a greater extent than do Cl bleach liquors, chiefly as a result of the loosening of the goods by frequent boiling. The consumption of rinsing water is less with peroxide bleach, and S is removed from viscose rayon and staple rayon. H_2O_2 bleaching produces only water, while the Cl liquors leave HCl and the alkali per salts and peroxide increase the alky. of the bleaching baths to an undesirable extent. H_2O_2 is used at 80-90° in faintly alk. soln. Because of the high rate of decompn. of peroxide baths in the presence of catalysts all pipe lines must be made of such noncatalysts as Ni, hard Pb, bronze and nonrusting V2A and V4A steel. The bath is also stabilized with silicic acid, alk. and earth alk. silicates, Mg. compds., pyrophosphates, NaOH and AcONa, alc. sulfonates and a mixt. of pyrophosphates with NH_4 sulfonates. The repression of O formation upon increased addn. of stabilizers depends primarily on the alky. of the bleaching bath.

55. Bleaching Rayon. *Chem. Abstracts* 1938. Homer E. McNutt. (to Tubize Chatillon Corp.). U. S. 2,105,839 Jan. 18. A method of inhibiting the corrosion of Al in the presence of aq. soln. contg. an alkali metal hypochlorite and free alkali comprises neutralizing the free alkali content of the soln. with a compd. selected from the group consisting of carbonic acid, acetic acid, boric acid and borax, and bringing the soln. thus neutralized into contact with the Al.

56. (Use of) Sodium Bicarbonate with Calcium Hypochlorite Bleaching Liquors. *Chem. Abstracts* 1938. Ernest Fr. Gobel. *Melliand Textilber.* 19, 64 (1938). The comparative actions on cotton yarn (scoured and unscoured) of $Ca(OCl)_2$ bleaching liquors (3% active Cl, pH 8.8 contg. addns. of Na_2CO_3 (3.5 g./l.), NaOH (2.5), aq. NH_3 (1.25), $NaHCO_3$ (5.0), NH_4Cl (5.0) and NaCl (5.0), having pH 10.6, 11.0, 10.6, 7.6, 8.2 and 8.5 resp., were measured by the Cl consumptions and the whiteness of the cotton after treatments for 10 and 60 min. For rapid bleaching, addn. of $NaHCO_3$ is considered beneficial since its accelerates bleaching and gives a better white although there is a high Cl consumption; prolonged bleaching produces tendering and a yellower white. Substitution of $NaHCO_3$ by HCl to produce a bleach liquor having the same pH (7.6) is less effective. Addn. of aq. NH_3 and NH_4Cl yielded an opaque bleached yarn in spite of thorough scouring and the rate of bleaching was retarded considerably. The Cl consumption was higher with the scoured yarn.

57. The Function of Catalysis in Textile Chemistry *Chem. Abstracts* 1938. Hans J. Henk. *Melliand Textilber* 18, 815-16 (1937). The decompn. of both hypochlorite and H_2O_2 in bleach liquors is catalyzed by Cu and Fe compds. Present in the bath as impurities. This catalytic effect is accelerated in case of hypochlorite by H ions and in case of H_2O_2 by OH ions. Light accelerates in decompn. of both. Surface-active materials like alcs. and ketones counteract the effect of the heavy metal salts; however, to be effective these must be added to the bath before the bleaching agent is added.

58. Bleaching Textile Fibers. *Chem. Abstracts* 1938. Soc. anon. Robert Descendre. Fr. 817,226 Aug. 30, 1937. The fibers are steeped in slightly acidulated water, rinsed and introduced into a bath contg. an emulsion of K soap and preferably glycerol and sulforicinate. If hypochlorite is added, bleaching is obtained in this bath as well as degumming. The fibers are finally introduced into a fixing bath contg. oxalic or formic acid. The temp. of each bath is 20°.

59. Bleaching Cotton Goods by Means of Sodium Hypochlorite in Presence of Sodium Bicarbonate. *Chem. Abstracts* 1938. V. I. Minaev, P. V. Moryganov and N. G. Kleming *Legk. Prom.* 16, No. 67-78 (1937). The addn. of $NaHOO_3$ imparts a high activity to NaOCl solns. owing to the liberation of HOCl, such as to permit bleaching of the fabrics in 1 min. at 20° at a hypochlorite concn. equiv. to 1 g. available Cl per l. As the conditions are quite mild, the short time required for bleaching does not allow of any appreciable attack of the fiber, but at the same time is sufficient for the complete destruction of other incrustants. On the other hand, $NaHCO_3$ acts as a buffer, which ensures the constancy of the pH of the bleaching solns.

60. Accelerated Bleaching of Linen Fabrics. *Chem. Abstracts* 1938. O. E. Itina *L'no-Pen'ko-Dzhutovaya Prom.* 6, No. 3, 49-57 (1936). *Chem. Zentr.* 1937, I, 1324. Bleaching according to the emulsion process is accomplished by 2 treatments of alk. boiling chlorination and acidification for fabrics from 25% bleached yarn and by the use of 3 steps for raw fabrics.

61. Should Cotton be Bleached with Hypochlorites or Peroxides? *Chem. Abstracts* 1937 O. Mecheels. *Monatsh. Seide Kunstseide* 42, 298; *Klepzig's Textil-Z* 40, No. 33, 5; *Deut. Wollen-Gewerbe* 69, 870 (1937). No fundamental superiority of the peroxide-bleach method over the Cl-bleach method and vice versa can be recognized. The method to be used for a par-

ticular material should be chosen with consideration of the nature of the textile, finishing method employed, uses of the textile and the results required. In the case of the peroxide bleach it is best to raise the temp. as rapidly as possible and to add soda in order to increase the yield. During the hypochlorite bleach pH measurements must be made constantly.

62. Influence of Addition of Sodium Bicarbonate to Chlorine Baths. *Chem. Abstracts* 1937. H. Wasser. *Melliand Textilber.* **18**, 225-6 (1937). The addn. of bicarbonate results in better white, but the pH at which the bath is buffered is in a zone damaging to fibers.

63. Bleaching Bast Fibers. Paul Bald. *Chem. Abstracts* 1937. Ger. 649,081, Aug. 14, 1937. Crude bast fibers, or yarns or fabrics prepd. therefrom, are treated with a soln. of HOCl until about one-half of the active Cl content of the bath has been utilized. Bleaching is then completed with an alk. hypochlorite soln., without any intermediate treatment.

64. Chlorine Bleaching. *Chem. Abstracts* 1937. Egon Elod and Franz Vogel. *Melliand Textilber.* **18**, 64-8 (1937). Among matters considered are the relation of hypochlorite and chlorate, the influence of pH, changes in pH during bleaching. effect of pH on tearing strength, I no. and degree of bleaching.

65. Hypochlorite Bleaching Investigations. *Chem. Abstracts* 1937. J. Dumas. *Rev. Gen. Mat. Color,* **41**, 251-2 (1937). A discussion and comparison of various investigations. Chloroamines are more sol. in alkalies than in acid, therefore hypochlorite rendered alk. gives better results in practice.

66. Chemical Bleaching of Linen Fiber. *Chem. Abstracts* 1937. M. Chilikin. *Melliand Textilber,* **18**, 365-7 (1937). With a view to accelerating the bleaching operation, the fiber was tested for whiteness, capillarity, Et_2O ext., N%, Cu and NaOCl nos. at every stage of an exptl. process consisting of a lime digestion, 7 caustic digestions and 4 chlorinations. From the results, C, concludes that the N-contg. and waxy materials should be removed as quickly as possible with min. decompn. of the cellulose. The removal of the waxy impurities is one of the chief difficulties of the process. These materials yield very stable chlorination products which darken in color during drying and storage. Addn. of an emulsifying agent during the caustic digestion facilitates the removal of waxy substances. It also reduces the boiling time to 1-2 hrs. at atm. pressure. Ligin is best removed by chlorination with hypochlorite of const. concn. Optimum conditions for bleaching are a weakly alk. chlorination liquid and a temp. not above 25-30° for a max. concn. of 5 g. active Cl_2 per 1. As a result of this work, the bleaching of flax can be carried out in 1-2 days.

67. Reaction Possibilities of Bleaching Liquors Contg. Chlorine. *Chem. Abstracts* 1937. Hans J. Henk. *Monatschr. Textil-Ind.* **52**, 86 (1937). The active constituent of industrial Cl liquors is HClO which may undergo 3 different reactions depending upon the H-ion concn. of the soln. and resulting in 3 different bleaching actions. All 3 reactions occur simultaneously and it is possible to influence them somewhat by adjustment of the acidity. In neutral soln. HCl and O are formed causing a damage of the textiles by the formation of oxycelluloses. The dissocn. of the HClO and the liberation of O are increased by a rise in temp. and the presence of catalysts. In acid soln. water and Cl are formed, thus preventing any oxidizing action. This action of HClO is utilized in the chlorination of proteins and in the I. B. Korte process of bleaching bast fibers. In alk. soln. HClO forms double compds. with org. substances. When HClO forms an org. addn. compd. its former state of equil. is disturbed and results in the formation of mol. acid from its ions accompanied simultaneously by a suppression of the dissocn. of the acid by the presence of OH ions. As the liberation of free Cl from mol. HClO practically begins at a pH of 7 the formation of addn. compds. in alk. soln. greatly exceeds any O and Cl effect. This explains the much purer and more const. bleaching effect resulting from peroxide bleaches as compared to HClO bleaches. As in most cases these addn. compds. remain on the fiber; owing to their insoly. it is possible at times to reform the natural dyes by the liberation of HCl. This explains the relatively frequent occurrence of the change to yellow of HClO-bleached textiles which never occurs to the same extent in peroxide-bleached goods. The alk. hypochlorite bleach is easier on the fiber than the O bleach as HClO forms no compas. with cellulose. Only active O can damage the fiber in bleaching operations.

68. The Bleaching of Cotton by Hypochlorites. *Chem. Abstracts* 1937. M. J. Dumas. *Rev. Gen. Mat. Color.* **40**, 429-31 (1936). A compendium is given.

69. The Chemical Changes in Dyes During the Chlorine Bleach Process. Eugen Shiloy. *Chem. Abstracts* 1937. *Melliand Textilber.* **17**, 425-7, 504-5, 734-6 (1936). Some new data on the speed of reaction of chlorine with certain dyes is given. With most dyes the auxochrome group is attacked, which usually results in the formation of colorless trichlorphenols or trichloroanilines.

70. Chemical Conversions of Dyes by the Chlorine Bleach. *Chem. Abstracts* 1937. E. A Shilov and G. V. Kupinskaya. *Byull. IvNITI* **12**, No. 6, 22-31 (1936). Studies on the effect of HClO and its salts on dyes were continued by examg. the function of chromophores and auxochromes in the mol. independent of each other by the methods previously described. From the examn. of compds. contg. either a chromphoric or auxochromic group and dyes contg. the 2 groups, it is concluded that the action of HClO and hypochlorites is detd. by the presence of activating auxochromic groups. The 1st stage of reaction consists in most cases in chlorinating the aromatic rings in the o- and p-positions to the auxochrome in the mol. The actual bleaching is effected as a result of the cleavage of the dye in the o- and p-positions to the auxochromes, whereby the mol. residue, bearing the auxochrome is converted into the corresponding chlorinated PhOH or $PhNH_2$. In other cases such as amino compds., a condensation into some more complex dyes can take place. As a secondary reaction, particularly in a neutral or alk. soln., a simultaneous decompn. of the dye by oxidation can result. The process is also governed by the action of the auxochromic groups.

71. Calcium Hypochlorite. *Chem. Abstracts* 1938. Jacques Ourisson. *Rev. Gen. Mat. Color.* **41**, 471-7 (1937) *Bull. Soc. Ind. Mulhouse* **103**, 217-26. The conditions of formation and of existence are given of several hypochlorites; $Ca(ClO)_2$ $2Ca(OH)_2$ or dibasic: $3Ca(ClO)_2$ $2Ca(OH)_2$ $2(?)H_2O$ or 2/3 dibasic; $Ca(ClO)_2$ 3H or neutral. Tri basic Cahypochlorite exists only below 20°. Photo-micrographs are shown.

72. Calcium Hypochlorite Pellets Suitable for Treating Water, Bleaching, etc. *Chem. Abstracts* 1936. Walter S. Bachman. U. S. 2,023,459, Dec. 10. Stable Ca hypochlorite pellets are produced by mixing a $CaSO_4$ material such as plaster of Paris with a hypochlorite such as bleaching powder and with addn. of more than sufficient water to hydrate the sulfate, permitting the sulfate to hydrate at least partially and then subjecting the mass to rapid dehydration to set the hydrated sulfate and avoid hypochlorite decompn.

73. Hypochlorite Bleaching of Cotton. *Chem. Abstracts* 1937. Alfred Schmidt. *Melliand Textilber.* **17**, 878-80 (1936). Injury to the fiber, its causes and prevention are discussed.

74. Bleaching Cotton and Flax. *Chem. Abstracts* 1936. Irwin J. Smith. U. S. 2,020,437, Nov. 12. The unboiled material is subjected to the action of a hypochlorite soln. until a partial bleach is obtained and seeds, motes, and shives are partly removed, then treated with a fresh bath contg. an "antichlor" such as NH_4OH and with alk. peroxide soln., and then boiled to give the desired degree of bleaching and the seeds, motes and shives are completely removed.

75. The Stability of Chlorine Bleach Liquors. *Chem. Abstracts* 1936. A. Foulon *Deut. Wollen-Gewerbe* **68**, 991-2 (1936). The decompn. of the acid soln. of a Cl bleach bath is due to the oxidation of the hypochlorite ions to chlorate ions as caused by HClO. The H ions formed combine with ClO ions producing undissociated HClO so that the concn. of the latter is const. as long as there is hypochlorite left. The following equil. holds in acid soln.: $d(ClO^-)/dt = -k(HClO)^2 (ClO^-). K(OlO^-)/OH^-)$, where K is the const. of hydrolysis of the hypochlorite. If the HClO is the oxidizing agent in the alk. soln. then $d(ClO^-)/(dt = -K(HClO) (ClO^-) = -kK(ClO^-)^2/(OH^-)$. Since in the alk, soln. the amt. of free HClO is very small compared to the ClO ion $dx/dt = -kK(x^2)/(OH^-)$, $(l/x) - (l/x_o) = (kK/(OH^-)t$, and $r/xt = kK/(OH^-)$, where x is the amt. of active Cl deted by titration with O.l N H_3AsO_3, r the rate of opposing reaction $(x-x)/x$, and x the original hypochlorite content. In NaOH soln. r/xt is const. at 25°, 30° and 40°. For such NaOH solns. and various temps. and concns.

$(1/x) - (1/x) = k_r t$ or $V - V = K_r t$ if dilns. are used instead of concns. V is the no. of l. of solns. calcd. for a mol. of NaClO of concn. x. The fact that an increased alky. increases the stability of the soln. is expressed by $K_r = kK(OH^-)$. The imperfect constancy of the product $(OH^-)k_r$ is due to the fact that the alkali content is not the true measure of the activity of the OH ions. Old bleach liquors contain as much chloride as hypochlorite which may cause neutral salt effects. Expts. made on dil. hypochlorite solns. of definite hypochlorite, alkali and neutral salt contents showed that the larger the amt. of salt added the greater the suppression of the caustic. As the constancy of k_r holds for long periods, it is possible that the neutral salt effect of the hypochlorite is of the same order as that of the chloride and chlorate. The neutral salts may decrease the activity of the OH ions. If K_w and K_u are the dissocn. consts. of water and $HClO$, resp., then $(OH^-) = k_w/(H^+)$, k_w/k_u and $k_r = (k/k_u)(H^+)$. The last relationship points to the autodecompn. of bleaching liquors as a catalysis of the H ions. The extremely low conc. of H ions in alk. solns. is sufficient to start the reaction. According to the latest activity theory the activity factors can be included in the consts. Therefore, if h = H-ion activity, $k_r = (k/k_u)h$; hence this const. is directly proportional to the H-ion activity.

76. Kier Loading and Boiling for the Chlorine Bleach. *Chem. Abstracts* 1936. J. Andrew Clark. *Cotton* **100**, 59-62 (Mar., 1936). Thorough and complete removal of the natural and added impurities is essential for satisfactory kier boiling. The vertical kier is described and the purposes of kier boiling, kier capacities and the making and compn. of kier charges are discussed.

77. Studies Concerning Chlorine Bleach. *Chem. Abstracts.* 1936. V. I. Minaev. *Melliand Textilber.* **17**, 219-20, 326-8 (1936).

78. Bleached Woven and Knitted Cotton Fabrics, Changing to Yellow. *Chem. Abstracts* 1936 Walter Bruckhaus *Spinner u. Weber* **54**, No. 24, 9-11 (1936). While pure cotton fabrics will turn yellow only very slowly this change in color is hastened greatly if certain contaminations are present such as alkalies, Fe compds., fats, resins, etc. The degree of purity of cotton and its storage quality can be tested by (1) boiling a sample with dill. NaOH, (2) moistening a spot of the material with dil. NaOH or NH_3 and (3) subjecting the sample to steam. Another factor is the chlorination bleach of the cotton. Too long an exposure to Cl or too high a concn. may bring about the superoxidation of cellulose and may cause the material to become yellow. The yellow color may also be caused by treatment with soaps made from unsatd. acids, mineral oils, water contg. Fe, salts and oxides of Mn, the action of acid vapors or baths on fabrics bleached with ultramarine, excessively hot drying, ironing, calendering, etc. The presence of aniline vapor may change the white tint to pink.

79. Nonlustrous Bleached Rayon. *Chem. Abstracts* 1936. Fukui Senshoku K.K. (Tetsuya Izeki, inventor) Japan. 110,841, May 17, 1935. By treating with a bleaching powder soln. (2°Be.) and then with 8-10% $(NH_4)_2CO_3$ soln., rayon is bleached and becomes nonlustrous.

80. Liquid Treatments of Fabrics as in Bleaching. *Chem. Abstracts* 1935. Fritz Seidel and Julian Ronke (to Christian Dierig A.-G.) U. S. 1,992,778, Feb. 26. Material such as cotton fabric is treated with a liquid such as hypochlorite soln. and the action of the liquid is promoted by passing an a.c. through the material the frequency of which is not greater than 500 cycles per sec. but is sufficiently high to prevent electrolysis of the liquid treating agent, which is a conductor of electricity.

81. Stable Sodium Hypochlorite. *Chem. Abstracts* 1935. Carl W. Kuehne. U. S. 1,996,769 April 9. A dry inert gas such as CO_2-free air is passed through a body of crystals of Na hypochlorite tetrahydrate while the temp. is maintained below the m.p. of the crystals, and this treatment is continued until the water content of the material is reduced to from 2 to 3 mols. App. is described.

82. Sodium Hypochlorite from Soda. *Chem. Abstracts* 1935. I. Semenova. *Lnopenkodsbutovaya Prom.* **3**, No. 6, 63-6 (1933); *Chem. Zentr.* 1934, **II**, 3158. The stability of NaOCl solns. prepd. from Na_2CO_3 solns. and Cl_2 was investigated. From a soln. contg. 100 g./l. of Na_2CO_3 stable solns. can be obtained having a Cl content only up to 20 g./l./their phenolphthalein alky. must not be less than 4 g./l. NaOH. Upon raising the Cl content to 22 g. the alky. falls to 0.18 g./l. NaOH and the soln. loses 50% of its Cl in 1 day. In a soln. contg. 125 g./l. Na_2CO_3, 28 g./l. Cl is to be regarded as the limiting concn. (alky. 6.77 g./l. NaOH). Solns. obtained by chlorination of $NaHCO_3$ solns. are exceedingly unstable; the reaction takes place according to the equation: $NaHCO_3 + Cl_2 = NaCl + CO_2 + HOCl$, without the formation of NaOCl.

83. Bleaching of Textiles. *Chem. Abstracts* 1935, p. 2760.[6] Liquid Treatments of Fabrics as in Bleaching. Fritz Seidel and Julian Ronke (to Christian Dierig A.—G.). U. S. 1,992,778, Feb. 26. Material such as cotton fabric is treated with a liquid such as hypochlorite soln. and the action of the liquid is promoted by passing an a.c. through the material the frequency of which is not greater than 500 cycles per sec. but is sufficiently high to prevent electrolysis of the liquid treating agent, which is a conductor of electricity.

84. Bleaching of Textiles. *Chem. Abstracts* 1935, p. 5284.[5] Bleaching Textiles. Friedr. H. Eicken. Ger. 609,992, Feb. 27, 1935 (Cl. 8*a*. 18). Textiles are bleached by subjecting them alternatively for short periods to the action of air and a bleaching liquor, in closed or open vessels.

85. Bleaching of Cotton, and Cotton-Silk Fabric. *Chem. Abstracts* 1935, *p.* 8360.[5] Bleaching Cotton and Cotton-Fabrics. B. S. Voronkov and N. V. Filippov. *Russ.* **35**, 810, Apr. 30, 1934. The fabric is treated intermittantly with caustic in the presence of wetting substances, alkali salts and bleaching solns. at periods not exceeding 7 min. and a temp. not over 100°; this is followed by a steam-jet treatment to remove the soln. from the fabric.

86. Bleaching with Chlorine. *Chem. Abstracts* 1935, p. 3845.[9] W. L. Savell. *Am. Dyestuff Reptr.* **24**, 189-92 (1935).—The smallest amt. of bleach soln. that will satisfy the requirements should be used. A standard strength stock soln. should be maintained and the lowest workable alky. established in it. The active bleaching period should be kept at a min. for the degree of bleaching desired.

87. The Behavior of Rayons in the Presence of Bleaching Liquors. H. Russina *Chem. Abstracts* 1935. *Monatschr. Textil-Ind. Trade Issue II*, **50**, 60-2 (Aug., 1935). Under the same exptl. conditions hypochlorite bleaching caused equal damage in cotton which had been treated with lye and in rayon, while crude cotton was not attacked at all. This result is attributed to the presence in untreated cotton of materials more easily oxidized than cellulose, which exhaust the hypochlorite before the cellulose is attacked. Unsuccessful attempts were made to prevent damage to rayon and lye-treated cotton by controlling the hydrolytic equil. of the bleaching bath by addn. of substances of alk. reaction. Better results were obtained by addn. of weak org. acids or acid-reacting salts which neutralize the OH ions produced by hydrolysis thus liberating a large amt. of free HClO. The bleaching power can also be increased by the use of certain textile aids, e.g., sulfonated oils. In dyeings involving the use of indanthrene ruby the Cl bleaches damage the material under conditions under which the undyed material is not attacked. In this case the hydrolysis equil. cannot be influenced and the damage to the fiber must be due to catalytic action. In the last two types mentioned, the more pronounced action of Cl liquors is nearly completely compensated for by the addn. of salts, particularly soda, which has no effect upon the hydrolysis of the NaClO but which is capable of repressing the action of the textile aid so that the effect of the bleaching liquor is lowered to a value favorable to the fiber without in any way excluding the favorable influence of the textile aid on the bleaching process.

88. -Bleaching Vegetable Fibers. *Chem. Abstracts* 1935. I. G. Farbenind A.-G. (Wilhelm Waibel, inventor). Ger. 615,680, July 9, 1935 (Cl 8*i*. 2). Cotton, etc., is bleached by treatment with a bath contg. both hypochlorite and an oxidizing bleaching agent at 30-80°. The alky. of the Cl bath corresponds to 0.5-3 g. NaOH per l. An amt. of active 0 equal to 0.05-0.2 g./l. is added and the temp. raised to 70-100°. Thus, cotton is steeped for 10 min. in hot water and placed in a bath contg. 2.2 g. active Cl and 1.5 g. NaOH per l. at 32°. The temp. is raised to 75° and H_2O_2 added. The bleached cotton is finally rinsed.

89. Bleaching Textiles. *Chem. Abstracts* 1935. Walter Huessy. Fr. 768,285, Aug. 3, 1934.

The textiles are treated in a closed kier alternately with a bleaching liquid and steam.

90. The Dyeing, Bleaching and Chemical Technology of Jute. *Chem. Abstracts* 1935, 8. D. Varma. *Indian Textile J.* 45, 201-3 (1935). The varieties and cultivation of jute are outlined, also retting and stripping, and special attention is given to bleaching. Hypochlorite, Na_2O_2 and $MgSO_4$ Na_2O_2 and H_2SO_4, and $KMnO_4$ and H_2SO_4 are the bleaching processes applied to jute.

91. The Bleaching (of Cotton Yarns) on Warp Beams. *Chem. Abstracts* 1935. *Richard* Golbs. *Spinner u. Weber* 52, No. 13, 6-8 (1934). The advantages of bleaching on warp beams are given, as well as mech. details of the app. The following methods can be used: (1) boiling, Cl or acid bleach methods, (2) Griesheim intermediate hot-water treatment, (3) combination hypochlorite-O (Na_2O_2 or H_2O_2) method and (4) pure O bleach method.

92. Bleaching Cotton and Cotton-Silk Fabric. *Chem. Abstracts* 1935. B. S. Voronkov and N. V. Filippov. *Russ,* 35, 810, Apr. 30, 1934. The fabric is treated intermittently with caustic in the presence of wetting substances, alkali salts and bleaching solns. at periods not exceeding 7 min. and a temp. not over 100°; this is followed by a steam-jet treatment to remove the soln. from the fabric.

93. Bleaching of Textiles. *Chem. Abstracts* 1934, p. 344.[3] Desizing and Bleaching Textiles. De Eibergsche Stoombleekerij voorheen de Firma G. J. Ten Cate & Jonen. Brit. 395,306, June 13, 1933. Textiles are desized and bleached by treatment under pressure with an enzyme bath and the usual bleaching baths, said baths being successively circulated through the material in the same vessel. App. is described. The walls thereof are manufd. from or lined with an alloy contg. Fe, Cr., Ni, C and not less than 2% Mo, e.g., an Fe alloy contg. Cr 18, Ni 8, C 0.15 and Mo 34%.

94. The Chlorine Bleach. *I.* The Theory of the Chlorine Bleach. Eugen Shilov and Vassili Minaev. *Milliand Textilber.* 15, 221-4, 226-9 (1934). Since dyes are generally unsatd. they could add HOCL to their double bond, thus destroying or changing their color. Oxidation thru subsequent splitting off of H_2O or HCL might also explain the bleaching effect. Studies on the effect of HOCL on dyes were made both on solns. of the dyes and on dyed fibers. The dyes used were Orange II (I) (Schultz No. 189 [7th Ed.]), Benzoazurine G. (Sch. No. 497), True Yellow (Sch. No. 172), Diamine True Scarlet 83N (Sch. No. 587), and Indigo Carmine. The results are presented in a series of curves which show that the rate of bleaching is greatly increased by NaCL, HCL or NaOH over that of HOCL alone. HCL produces a greater effect than NaCL. The NaOH-HOCL curve passes thru a max. which is not the same for each dyestuff. CL-water performs like an equinol mixt. of HCL and HOCL. At low H^+ concn. CL^- loses its catalytic effect. H^+ catalyzes the bleaching effect of HOCL. Neutral salts in dilute. soln. have no catalytic effect; in acid soln. they retard the bleaching action by decreasing the concn. of undissociated HCL. The effect of initial concn. of HOCL upon rate of bleach was not definitely established. The results of these studies upon the reaction between HOCL and dyestuffs are analogous to those obtained with unsatd. compds. Conductivity measurements following the action of HOCL upon I in the presence of HCL indicated no increase in HCL so S. and M. conclude that no oxidation has occurred. In the case of dyed fibers, HCL and NaCL exhibited their usual catalytic effect but NaOH retarded the bleach. This is attributed to the formation of alcoholaties of cellulose. These alcoholates fix the active HOCL and prevent it from reacting with the dyestuff if the dyestuff is fixed upon the fiber but not otherwise. These threads simply impregnated with I were bleached as rapidly in the presence of NaOH as solns. of SI had been. S. and M. review and criticize the theories of bleaching by HOCL offered by *Weiss* (*Chem. Abstracts* 24, 5589; 25, 2044,5172) Kaufman (*Chem. Abstracts* 19, 561; 24,, 5589; 25597) and Clibbens and Ridge (*Chem. Abstracts* 21, 2192). Practically, the CL bleach should be carried out in acid soln.

95. Bleaching of Cotton, With Hypochlorite. *Chem. Abstracts* 1933, p. 4086.[4] The Chlorine Bleach. Willy Seck. *Melliand Textilber.* 13, 314-16 (1932).— Cotton cellulose adsorbs measurable amts. of hypochlorite from weakly alk. hypochloric solns. The adsorption, as far as investigated, follows Fruendlich's adsorption isotherm. The value of the adsorption exponent is $1/n = 0.385$ and of the adsorption const. $a = 8.75$ for a ratio of alkali: hypochlorite of 1 mol. of NaOH to 42.2 mols of NaCl.

96. Bleaching of Cotton, Etc. *Chem. Abstracts* 1933, p. 2314.[6] Treating Materials Such as Cotton for Bleaching. Richard Feibelmann. U. S. 1,892,548, Dec. 27. The material is treated in an aq. bath with p-toluenesulfondichloroamide in the presence of an alkali metal compd. of alk, reaction such as Na_3PO_4 at temp. above atm. temp. (suitably about 70° or higher).

97. Bleaching of Textiles. *Chem. Abstracts* 1933, p. 3089.[5] Bleaching Textiles. I. G. Farbenind. A.-G. Brit. 371, 494, Feb. 26, 1930. Bast fibers, especially flax and hemp, are quarter- to half-bleached and freed from lignin constituents by a process of 4 states: (1) bowking in Na_2CO_3 soln. (2) treating in a bath contg. HClO with sufficient HCl to give free Cl and of pH <5, (3) washing by infusion with Na_2CO_3 or similar alk. soln. and (4) treatment in an alk. or neutral hypochlorite soln. Bleaching textiles. I. G. Farbenind. A.-G. and Helmuth Korte. Brit. 371,496, Feb. 3, 1931. Addn to 371,494 (preceding abstr.). The process of 371,494 is modified in that the bowking stage is replaced by soaking several hrs. in a warm Na_2CO_3 soln. contg., if desired, caustic alkali and the acidity of the HClO bath is adjusted to a pH <4.5. Bleaching liquid for textiles, R. Bruch. Swed. 72,287, July 28, 1931. A. dil. aq. soln. of H_2O_2, HOCl and H_2SO_4 together with $MgSO_4$ and a fat solvent is specified.

98. Bleaching of Cotton. *Chem. Abstracts* 1932, p. 4186.[1] Bleaching Raw Cotton. Deutsche Gold-und Silber-Scheid-Ennstalt Vormals Roessler (Karl L. Vieweg, inventor). Ger. 548, 710, Nov. 23, 1927. The cotton is treated first with dilute bleaching soln. The strength of the bleaching soln. is then increased by continuous or discontinuous addn. of further bleaching agent.

99. Bleaching of Textiles, Reviews on. *Chem. Abstracts* 1932, p. 5212.[9] The Chemistry of Hypochlorite Bleaching. M. M. Chilikin. *Izvestiya Teksted. Prom.* 10, No. 9, 47-52 (1931); *Chimie Industrie* 28, 155-6.—A review of the reactions involved in the hypochlorite bleaching of textiles.

100. Bleaching of Cotton Goods. *Chem. Abstracts* 1932(p. 6146.[7] Cotton Piece-Goods Bleaching. J. Arthur Boyd. *Melliand Textile Monthly* 3, 493-5, 580-3 (1931).—The method including the single boil and NaOCl bleach is discussed in detail.

101. Bleaching of Textiles with Hypochlorite. *Chem. Abstracts* 1932, p. 5212.[9] Deteriorations Which Can Take Place During the Bleaching (of Textiles by Hypochlorites). J. Ernst. *Monatscher Textil-Ind.* 46, 395 (1931): *Chimie Industrie* 28, 156-7.—A general discussion.

102. Bleaching of Textiles. *Chem. Abstracts* 1932, p. 2329.[1] Bleaching Textiles. Alfred Paul. Ger. 538,544, Nov. 19, 1930. The bleaching liquor is preheated and circulated in the app., the bleaching taking place under pressure. The pressure is regulated by addn. of condensed water from the preheating device.

103. Hydrogen Peroxide, Activation of Hypochlorite Solutions With. *Chem. Abstracts* 1932, p. 2369.[3] Reaction Chains in Oxidation Processes. Hugo Kauffmann. *Ber.* 65 *B*, 179-84 (1932).—The behavior of activated hypochlorite solns. was studied, with H_2O_2, NH_3, N_2H_4 and various acid amides as activators. In each case the strength of the soln. as an oxidizing agent was greatly increased by the presence of the activator. The measure of activity was the time required to bleach a standard dye soln. The effect is interpreted on the basis of the Haber-Willstatter theory. The Activators are substances that cause the formation of hydroxyl in soln. With H_2O_2 the process is: $H_2O_2 + ClO^- \rightarrow HO_2 + Cl^- + OH$. The OH reacts further: $OH + ClO^- \rightarrow ClO + OH^-$. The reaction regenerates OH: $ClO + ClO^- + OH^- \rightarrow 2Cl^- + O_2 + OH$. This can continue until the OH is used up in the reaction: $OH + HO_2$ $H_2O + O_2$. With neither catalyst nor activator present, the following reaction occurs: $HClO + ClO^- \rightarrow ClO + Cl^- + OH$. Hydrolysis of the hypochlorite forms HClO. The pH of max. activity is calcd. to be about 8, in agreement with expt. These equations explain why the decompn. of a hypochlorite is a 2nd-order reaction.

104. Bleaching. *Chem. Abstracts* 1932, p. 4114.[4] Soc. Des produits Peroxides. Fr. 721, 190

Aug. 10, 1931. Animal and vegetable products, particularly those contg. oil or fat, such as grains, fruit, bones, etc., are bleached by H_2O_2 or compds. yielding H_2O_2, in the presence of an org. solvent, such as alcs. benzine, C_6H_6, CS_2, $CHCl_3$, pyridine and CCl_4. The oil or fat is simultaneously extd. Bleaching. Hermann Wnzl. Fr. 722,871, Sept. 14, 1931. Bleaching is carried out by aq. solns. of hypochlorites, brought into contact with Ni, Co, Cu, their oxides or salts and with the addn. of alkali or alk. earth carbonates or hydrates. The alk., is regulated during the reaction to the mol. proportion of 1:2 to 1:3 between the Cl and the alkali hydrate or the quiv. proportion of alk. earth hydrate or alkali or alk. earth carbonate.

105. Bleaching of Textiles. *Chem. Abstracts* 1932, p. 2868.[8] The Loss of Weight of Cotton Treated with Hydrogen Peroxide Compared to That in Whitening by Boiling and Chlorination. W. Schramek and C. Schubert. *Rev. Gen. Mat. Color.* 36, 109-10 (1932).—Several qualities of cotton threads and fabrics were treated by three methods of whitening: (1) the usual industrial process of double boiling under pressure followed by chlorination; (2) double whitening in H_2O_2, strongly alk., at 80-90°; (3) simple whitening in H_2O_2 followed by ordinary chlorination. The comparisons as to loss in weight were always favorable to the H_2O_2 procedure, and in that case the loss can be further reduced by the addn. of a small amt. of aktivin. The loss may reach 2% with inferior goods, and is due in part to destruction of the fibers. The chief advantage of the new method is the elimination of boiling.

106. Bleaching of Textiles. *Chem. Abstracts* 1932, p. 2876.[8] Bleaching Textiles. Marie Bourrand, Fr. 717, 595, May 23, 1931. Linen and cotton are degummed by baths contg. Na_2SO_3 and bleached by baths contg. NaOCl and $NaHSO_3$.

107. Bleaching of Textiles. *Chem. Abstracts* 1931, p. 5569.[8] New Rapid Bleaching Process. N. V. Fillipov and B. S. Voronkov. *Izvestiya Tkstil. Prom. i Torgov.* 9, *Nos.* 8-9, 84-90 (1930); *Chimie & Industrie* 25, 1498-9: cf. *Chem. Abstracts* 25, 1389.—The fundamental idea of the proposed rapid process lies in the use for boiling of caustic soln. composed so as to increase its activity while at the same time taking into account the nature of the impurities to be removed. The greater activity of the soln. and its higher emulsifying power permit of cleaning the fibers in a short time and of decreasing the stability of the remaining adhering impurities toward Cl, so that the boiling operation can be shortened and at the same time rendered more efficient. The various operations are carried out continuously. By this system the time required for the complete bleaching operations is reduced to 90-105 min., of which 30-40 min. is at 85-90° in open vessels with the following liquor: NaOH 15-35 g., T "contact" 5-15 g., 38°Be'. Na_2SO_3 12.5-25 g., 39°Be'. Na silicate 7.5-10 g. per l. (this operation advantageously replaces the usual desizing and boiling which requires much more time). The goods are then washed with hot and cold water, chlorinated for 30 min. in a 0.2-0°-0.5°Bé. hypochlorite soln., washed, acidfied with very dil. H_2SO_4, washed and dried in the usual way.

108. Bleaching of Textiles. *Chem. Abstracts* 1931, p. 1389.[8] New Bleaching Process. A. P. Oranskii. *Izvestiya Tekstilnoi Prom, i Torgovli* 9, No. 1-2, 136-7 (1930); *Chimie & Industrie* 24, 943-4.—The process is carried out as follows: the fabric is impregnated on the jiffer with a 0.5° —Be' NaOH soln., placed in a Thiers boiler where it is heated 1 hr. at 85° with circulation of the liquor, washed in the boiler first with hot and then with cold water; after a light scouring, the goods are treated for 40 min. at 35° with hypochlorite soln. contg. 1 g. available Cl per l., washed, acidified with 0.3% H_2SO_4 at 20° for 20 min., washed twice and dried. By working carefully the goods are of as good quality as those bleached in the usual manner, except that they contain more oxycellulose because of the higher conc. of hypochlorite used. The process has been adopted by the largest dyeing and printing works in the U.S.S.R. (formerly Emile Zundel).

109. Bleaching, Acid Chlorine, History of. *Chem. Abstracts* 1931, p. 5988.[9] History of Acid Chlorine Bleaching. Hugo Kauffmann. *Papier-Fabr.* 29, Tech. wiss. Teil 447-8 (1931): cf. *Chem. Abstracts* 25, 2631.—A review.

110. Bleaching of Textiles with Cl. *Chem. Abstracts* 1931, p. 2000.[5] Use and Misuse of Chlorine in Textile Bleaching. W. L. Savell and J. W. Ivey. *Am. Dyestuff Reptr.* 20, 97-100 (1931).—Cl bleaches may be used from atmospheric temps. (cold) to 130°F. in the form of strongly alk. to slightly acid hypochlorites. Bleaches are prepd. by dissolving Cl in caustic soda soln. $NaHCO_3$ is unsuitable and unnecessary as a constituent of bleach liquors. Stock solns. are generally made at a concn. of approx. 30 g. per l. of available Cl. Bleaching With Liquid Chlorine or Hydrogen Peroxide 100 Volume for Hosiery. G. H. Dubois. *Am. Dyestuff Reptr.* 20, 151-2 (1931).—A discussion of formulas and their sp. application in bleaching.

111. Bleaching of Textiles. *Chem. Abstracts* 1930, p. 2899.[3] Firma F. X. Richter. Austrian 116,530, July 15, 1927. The packed goods are sprayed from above with bleaching liquor, which is supplied at such a restricted rate that the liquid moves through the goods by capillarity only. The spray is kept in motion, and the used liquor is returned to the spray.

112. Bleaching with Chlorine and Peroxide. *Chem. Abstracts* 1930, p. 2889.[6] A Simple Process of Bleaching with Chlorine and Peroxide. G. H. Dahlenvord. *Rev. Gen. Mat. Color* 33, 377-8 (1929); Leipziger *Monatschr. Textil-Ind.* June, 1939, 262-3.—Raw cotton is first treated with NaClO (2 g. active Cl per l.) for 2-2.5 hrs.; the patented Osmator sprinkler is used to give best penetration. A little NaOH is then added to avoid the formation of chloramines recognizable by their strong odor. Goods are then rinsed thoroughly in the same way for ¾-1 hr., after which the stone vat is filled with water, to which is added 3 l. Na silicate and 1 kg. Na_2O_2 per 100 kg. material. Heat to 85°F. and bleach for 3 hrs. Wetting-out agents may be added to assist penetration. It is claimed that, while goods bleached by this method are not as absorbent as when boiled with alk. peroxide, they are much softer, since the fatty bodies and the natural waxes are not removed. Strength tests show losses of only 2-3% against the usual 7% loss.

113. Bleaching of Textiles *Chem. Abstracts* 1929, p. 529.[9] Bleaching Textile Materials. C. Taylor. Brit. 286, 567, Oct. 12, 1927. Cotton linen, artificial silk or other vegetable material is satd. with a liquid contg. about 1% Na_2CO_3 and about 4.4% NaOCL, bleaching powder or Cl, the material is stored for about 12 hrs. and is then washed. The process may be repeated and the goods then soured. Temps. of about 22° are suitable and small quantities of borax or NH_3 may be added to the satg. liquid.

114. Bleaching of Cotton. *Chem. Abstracts*, 1929, p. 4077.[9] Purification of Cotton. V. Shaposhinikov and S. Yeserskii. Z. *Farben-Ind.* 20, 219-21 (1929); cf. *Chem. Abstracts* 22, 4827.—A study is made of the consumption of Cl during bleaching. 4-5 hrs.' bleaching with 0.5-1.0 g. Cl per l. at ordinary temp. is sufficient for bleaching well-cooked cotton fibers.

115. Bleaching of Cotton. *Chem. Abstracts* 1929, p. 3357.[4] Bleaching Cotton. Heraeus-Vacuumschmelze A.-G. and Wilhelm Rohn. Ger. 475-123, May 26, 1927. In bleaching cotton, particularly with hypochlorites, the cotton is wound on externally enameled bobbins or tubes made of Cr-Ni alloy, if desired, with addns. of Fe, Mo, W. or Co, or made of Ni, German Silver or Monel metal.

116. Bleaching of Cotton. *Chem. Abstracts* 1928, p. 4827[1] Purification of Cotton. V. Shaposhinikov and S. Yeserskii. Z *Farben-Ind.* 20, 60-4, 131-3, 177-80 (1928).—A study is made of the kiering and bleaching of cotton to det. the best conditions for conducting these processes. The optimum conditions found for kiering are as follows: 6 hrs. with 3% NaOH, 3 atms., ratio of cellulose to NaOH 100:8. The criteria used for judging the kiering conditions were the oxidizability of the waste liquor, a measure of the loss of cellulosic material, and the consumption of NaOH due to reaction. A study of the increased consumption of Cl with increased time of bleaching showed that the use of concns. of Cl over 1.0 g. per l. is unnecessary. With 0.5 g. Cl per l. after 4-6 hrs. the concn. was 0.0142%, while after 18 hrs. 0.0134% S. and Y. assume, therefore, that the consumption of Cl at first is due mainly to adsorption, and this Cl hardly takes part in the bleaching. In favor of such an assumption is cited the fact that cotton removed from the bleach liquor retains this odor of Cl even after a great deal of washing, a treatment with antichlor (hyposulfite) soln. being necessary to remove the odor of Cl. After the removal of the

cotton, the bleach liquor possesses a milky turbidity, the particles consisting of $CaCO_3$, very short fibers, and a small ppt. insol. in warm dil. HCl. The amount of this ppt. was too small to be identified. This series of articles is being continued.

117. Bleachang of Vegetable Fibers, Review on. *Chem. Abstracts* 1928, p. 4826.[8] Hypochlorite Bleaching. J. Auerbach. *Melliand Textiber*, 9, 769-70 (1928). — The effect of HOCL on the N compds. present in cotton after alk. digestion is oxidizing and chlorinating. The former leads to the formation of ketone acids of type formula RCOCOOH, while the latter results in formation of chloramines having type formula RCH(NHCl)COOH. Along with the production of the oxidation products, NH_3 is formed, which with HOCl yields NH_2Cl. Treatment with $NaHSO_3$ eliminates all chloroamines, which in themselves have no bleaching action.

118. Bleaching with Hypochlorites. *Chem. Abstracts* 1928, p. 1019.[7] H. Wenzl. U. S. 1,657,140, Jan. 24. In bleaching paper-stock or other materials with hypochlorite, aq. Ca (OCl) soln. is brought into contact with material contg. Ni in the presence of an alk. compd. of an alkali metal and the temp. of the bleaching soln. is adjusted to between 0° and 60°. The Ni-bearing material serves to catalyze the bleaching.

119. Bleaching of Textiles (Vegetable). *Chem. Abstracts* 1928, p. 3997.[6] Bleaching Linen, Hemp, Jute, etc. I. G. Farbenind. A.-G. Fr. 635, 014, May 25, 1927. Vegetable fibers which are difficult to bleach are treated after a preliminary boiling with a soln. of hypochlorite at the ordinary or a slightly raised temp. and then without rinsing with a soln. of permanganate. After rinsing, the deposit of MnO_2 is removed by a soln. of bisulfite, and the material is boiled with an alk. lye contg. reducing salts. To obtain a perfect white a final bleaching with H_2O_2 made alk. with Na_2SiO_3 is used.

120. Chlorine as a Bleaching Agent for Cotton. *Chem. Abstracts* 1928, p. 4256.[6] Yngve Dalstrom. *Svensk Kem. Tids.* 40, 106-18 (1928). —A critical review of current methosd in laundry investigations in which many tests are tabulated. Activated Cl is discredited as harmful to cellulose textiles. Cl forms oxycellulose much more readily than does O_2 and decreases more the tensile strength of cotton ribbons. This is explained by the formation of nascent HCl. Small quantities of sol. SiO_2 (60 mg. per l.) protect cellulose from injury by Cl. Perborates are favored as less injurious to fabrics and more efficient in oxidizing pigments.

121. Bleaching of Vegetable Fibers. *Chem. Abstracts* 1927, p. 1361.[9] Bleaching Vegetable Fibers. Chemische Fabrik Griesheim-Elektron, C. G. Schwalbe and H. Wenzl. Brit, 251,014, Jan. 22, 1925. Material to be bleached is drenched with concd. chlorinated lime bleaching liquor contg. at least 20 g. available Cl per l. and excess liquor is removed, sufficient liquor being left in the fiber to complete the bleaching.

122. Bleaching With Hypochlorite Solutions. *Chem. Abstracts* 1927, p. 996.[2] Bleaching H. Wenzl. Can. 266,945, Dec. 21, 1926. Aq. hypochlorite solns. are brought into contact with material contg. Ni in presence of alkalies.

123. Bleaching Cotton Cloth with the Hypochlorites. *Chem. Abstracts* 1927, 653.[2] Raffaele Sansone. *Textile World* 69, 1517-8, 1989-91, 2883, 2917, 3637, 4249-50 (1926); 70, 597-9, 603, 1141-2, 1711-2 (1926).—The processes, formulas and app. are discussed.

124. Bleaching with Hypochlorites Using Ni or its Compounds as Catalyst. *Chem. Abstracts* 1927, p. 3431.[1] Bleaching with Hypochlorites, Using Nickel or Its Compounds as a Catalyst. I. G. Farbenindustrie Akt.-Ges. Brit. 260, 190, June 22, 1926.

125. Bleaching with Sodium Hypochlorite, Na Silicate In. *Chem. Abstracts* 1927, p. 3273[2] Sodium Silicate and Sodium Hypochlorite. George Smith, Jr. *Textile Colorist* 49, 183 (1927).—The advantages of using Na silicate in the hypochlorite bleach bath are pointed out.

126. Bleaching of Cotton. *Chem. Abstracts* 1927, p. 653.[4] Cotton Bleaching. E. R. Trotman. *Ind. Chemist* 2, 481,-3 (1926). T. gives an account of the various substances present in the cotton fiber in addn. to cellulose, and follows with a description of the treatment (bowking) in the kier with 2% NaOH or with $Ca(OH)_2$ and finally describes the bleaching process carried out with bleaching powder.

127. Bleaching of Cellulose. *Chem. Abstracts* 1926, p. 822.[6] Koln-Rottweil Akt.-Ges. and E. Oppermann. Brit. 234,454, May 22, 1924. Bleaching with Na or Ca hypochlorites is carried out in the presence of a small quantity of NaOH, alk. earth hydroxide or Mg $(OH)_2$ which may be about 1% the wt. of the cellulose.

128. Various Methods of Augmenting the Energy of Hypochlorites. Anon. *Text. Mercury* 63, 63 (1920).—When the bleaching action of Cl takes place quickly the effect is superficial and the fibers again become yellowish in time. When the action is slow the Cl may attack the fiber, forming oxycellulose, and thus lower the strength of the material. The writer recommends that the time that the fiber is in contact with the Cl soln. should vary from 6 to 12 hrs. Brin's Oxygen Co.'s method employs O intimately mixed with Cl by which the time of treatment and quantity of chemicals used are reduced 30 to 40%. Schreiner's method uses an oxidized turpentine liquor, made by dissolving 22.5 parts CaO in 353 of water, bringing to the boil, adding 125 parts of resin and continuing the boil until the resin is completely dissolved. After cooling to 35°, 250 parts of turpentine are added and the whole is stirred until the soln. becomes clear. A compd. of O and turpentine is formed which has remarkable oxidizing and bleaching energy on all sorts of fibers, without attacking them. Another method of prepg. ozonized turpentine is to dissolve 125 parts resin in 210 turpentine, add 22.5 parts NaOH in 40 of water, and 90 H_2O_2 liberated from Ba or Mg compds. A jelly is first formed which turns to a liquid in a few weeks. This is called by the inventor "ozonine," and 0.065 g. of it in one liter of water has a strong bleaching action.

129. Some Chemical Problems in the Bleaching of Cotton. J. Merritt Matthews. *Color Trade J.* 6, 135-9 (1920).—The removal of the 6-8% of impurities from raw cotton constitutes a larger problem than that of bleaching. The quality of the water used in the boiling out and in the bleaching is of utmost importance. Bleaching with NaClO made from NaOH or Na_2CO_3 and Cl has advantages over $NaOCl_2$ soln. or NaClO made from $CaOCl_2$.

130. Bleaching Processes. E. T. J. Watremez. Brit. 139,457, Nov. 25, 1919. Addition to 135,516 (*Chem. Abstracts* 14, 1047). In the process of the principal patent in case it is intended to use the scouring bath in the cold, the reducing salt is completely omitted from the bath, which consists of a mixt. of the metal or its oxide, alkali, and alkali hypochlorite, as eau de javelles. The fibers are steeped in the bath by means of pressure rollers, and then placed in the kier. The fibers are treated after removal, one or more times, in an acid bath. Subsequent bleaching may not be necessary owing to the bleaching action of this scouring-bath. With fibers difficult to bleach, the operation may be repeated several times, with or without bleaching between two consecutive scourings.

131. Kier for Bleaching Textile Materials. G. B. Flood. U. S. 1,290,156, Jan. 7, 1919. The pat. relates to structural features of a bleaching-kier, and to a method of circulating liquid through it.

132. Bleaching Cotton Goods with Warm Solutions of Hypochlorites. M. Freiberger. *Farber-Ztg.* 30, 77-80 (1919).—The use of warm solns. of hypochlorites is practiced in the paper industry, in bleacheries handling cotton gauze and to some extent in bleacheries treating general cotton fabrics. In the continuous process of bleaching, in which the cloth is passed continuously through the bath, and the bath itself is agitated, it has been necessary to shorten the time of bleaching in order to make the process practicable. For example, the size of the containers for the hypochlorite solns. cannot be allowed to have too great dimensions. Increased speed of bleaching is best secured by raising the temp. of the solns. and by regulating the alkalinity of the bath. The advantages of warm solutions are discussed. It is claimed that in practice the consumption of hypochlorites is no greater in the warm process than in the usual cold process.

133. Hypochlorite Solutions with Free Acid, or Free Alkali, and Water of Different Degrees of Purity. M. Freiberger. *Farber-Ztg.* 30, 89-94 (1919). — Three solutions of bleaching powder were made from stronger solutions by diluting with distd. water or with well water. The solutions had the following properties: (1) 1.0 g. active Cl per l.; ratio of free to "bound" HClO 1:10; (2) 1.2 g. active Cl per l.; ratio 1::8.8; (3) 1.2 g. active Cl per l.; ratio, 1:17.8. Nos. 1 and 3 were prepd. with distd. H_2O, and No. 2 with well water. Thin and thick cotton

goods were bleached in these solns. at 37° for 35 min. The color obtained improved in the order 1-3 for thick wall bowked goods. With thin material, the colors of (1) and (3) were good, while No. 2 was distinctly poorer. The cellulose and Cu numbers of the samples were the same, and the methylene blue dyeings of (2) and (3) were equal, being somewhat heavier than that of (1), on account of the increased formation of oxycellulose. Nessler's reagent acted equally on (2) and (3). F. concludes that org. impurities and Fe compds. were adsorbed by sample (2), and the adsorbed materials were not removed by the subsequent washing and scouring. By converting the Ca salts partly into Na salts with Na_2CO_3 soln., the bleaching effect is diminished (rate of bleaching). The presence of excess Na_2CO_3 may give an improved white in time, since the warm alkaline soln. dissolves the decompn. products of the cellulose impurities and some of those of the cellulose itself. These decompn. products if not removed, impair the color of the washed and dried material.

134. Bleaching Cotton, etc. R. Muller. U. S. 1,163,438, Dec. 7. The material to be bleached is immersed in a dil. aq. soln. of NaOH, borax or other alk. compd. under 2 atm. steam pressure and air under pressure is blown through the soln. until the desired bleaching action is effected.

135. The Cause of the Pink Color Observed in Certain Hypochlorite Bleaching. H. G. Elledge. *J. Ind. Eng. Chem.* 8, 780-1 (1916).—When NaOCl solns. for use in laundering by treating a soln of $Ca(OCl)_2$ with a soln. of the so-called washing powder, after the $CaCo_3$ has settled out, a pink coloration invarial. The coloration has been found to be due to the presence of traces of NaMn being derived from the bleaching powder used, 0.02-0.04% of Mn in the powder would be sufficient to produce the color, in the production of which to general belief, Na ferrate has no part.

136. Injury of Vegetable Fibers During Bleaching with Bleaching-Powder Solutions in the Presence of Metals. P. Weyrich. *Z Ges. Textiland.* 18, 176-7, 819; *Chem. Zentr.* 1915, I, 1288-9.—White (*J. Soc. Chem. Ind.* 22, 132 (1903) observed weakening of vegetable fibers during bleaching in solns. of bleaching powder when the fibers were in contact with certain metals. Briggs also calls attention to a similar phenomenon in the presence of Cu (J. Soc. Chem. Ind. 30,397 (1911). It is known that the hydroxides and oxides of certain metals, such as Hg, Cu, Co, Ni and Fe, catalyze the decompn. of hypochlorite solns., O being liberated. This O converts cellulose into oxycellulose which is brittle. In the case of alloys, less is known in this regard. It is possible that some alloys do not act catalytically upon hypochlorites, and that these would be suitable for use in the construction of bleaching app. A number of com. alloys were tested by W. Borscher's alloy, which is a Cr-W steel, had the least action on the soln.

137. Theory of Bleaching. S. H. Higgins. *J. Soc. Dyers Colorists*, 30, 257-61.—Bleaching of vegetable fibers with hypochlorite should be explained without any reference to the acid treatment. Expts. described point to the conclusion that the bleaching action of hypochlorite solns. is due to free HOCl they contain. Sometimes the HOCl reacts with chlorites present, producing nascent Cl, which has energetic bleaching properties, but in all other cases the bleaching is due to direct oxidizing effect of the HOCl. The hydrolysis of metallic hypochlorites gives rise to HOCl. The addition of OH ions hinders hydrolysis, producing less, and the addition of hydrions accelerates, producing more HOCl.

138. The Formation of Chloroamines in the Bleaching of Cotton with Hypochlorite Solution. R. E. Crowther. *J. Soc. Dyers Colourists* 29, 38 40. It has been stated at various times that if in the bleaching of cotton, either sized or unsized, the operations of boiling with caustic solns. are omitted or are not of sufficient duration, the subsequent action of the Cl of hypochlorite solns. forms chloroamines. These chloroamines give rise to many undesirable effects, such as tendering and discoloration of the fiber on steaming or storing. Further, these chloroamines are supposed to be remarkably stable, withstanding subsequent souring, and as they are insol., are not readily removed from the cloth by washing. From a series of expts. C. concludes that the chloroamines are not retained by the fiber on washing, if, indeed, they are produced at all when gray cotton is treated with hypochlorite solns.

139. The Theory of Bleaching. *II.* S. H. Higgins. *J. Soc. Dyers Colorists* 30, 326 8 (1914) cf. *Chem. Abstracts* 8, 2255, 3369.—The statements of Taylor (preceding abstr.) are contradictory. Cotton and linen contain 2 coloring matters but there is no justification for the statement that cotton and linen both contain two coloring matters of the same characteristics but in different proportions. The coloring matters of both linen and cotton are evidently of an acid nature and the addition of acid liberates the color acid which is lighter in color than the color salt, and this must be borne in mind when comparing bleaching actions of an acid and of an alk. character. According to H., bleaching action is not due to production of free Cl by hypochlorites but (1) to the direct production of O and (2) production of nascent Cl.

140. The Action of Bleaching Agents on Various Natural Coloring Matters. R. *L. Taylor. J. Soc. Dyers Colorists* 30, 85, 89 (1914)—Cl or HClO alone will not completely bleach the coloring matter of linen; a hypochlorite must be present. The most efficient bleaching is obtained when sufficient alkali is added almost, but not quite, to neutralize the Cl and HClO. There are 2 kinds of coloring matter in unbleached linen. One is bleached by Cl and HClO, while the other is not readily bleached by these agents but is rapidly bleached by an alk. hypochlorite. T. believes that there are also 2 different coloring matters in cotton, and that cotton is not completely bleached with Cl and HClO but requires an alk. hypochlorite to complete the bleaching of the second coloring matter. The same is true of jute also. It is evident that the activity of bleaching liquors toward such coloring matters as Turkey red and indigo, which require only free Cl and HClO to bring about complete bleaching, is not a correct measure of the activity of the same bleaching liquor toward linen or even raw cotton. In the former case any condition which stimulates an increase of the amt. of free Cl or HClO increases the rapidity of the bleaching, but this is not so in the latter. In both cases an excess of alkali retards the bleaching, and T's expts. show that the best bleaching action is obtained when acid (HCl) is added to the bleach liquor in a very slight excess of the amt. necessary to neutralize the free alkalinity of the bath.

141. Recent Progress in the Manufacture and Application of Hypochlorite Solutions for Bleaching and Disinfecting Purposes. J. B. C. Kershaw. *J. Soc. Chem. Ind.*, 31, 54-7.

142. The Treatment of Water for Textil Finishing by Means of Electrolytic Sodium Hypochlorite. Francis D. Towne. *J. Soc. Chem. Ind.* 31, 477-8.—A water of 5-7° total hardness was treated with Cl prepared by a Haas and Oettel small T. U. type electrolyzer. This requires 110 volts continuous current at 10 amps., which will furnish from 4% brine soln., 600 l. of NaOCl having a strength of 3 g. active Cl per day. This is sufficient for the treatment of 200,000 gals. of H_2O per 10 hr. day working at 2 parts active Cl per mil. of H_2O. Cost (without depreciation) about $2 per week. After 10 days use the alga "Wlothrix," which had caused troublesome stains on the goods, ceased to grow. After a month, an objectionable green slime had also been done away with.

143. Experimental Investigation of the Bleaching Process. Sydney H. Higgins. *Proc. Chem. Soc.* 27, 314; *J. Chem. Soc.* 101, 222.—Solns. of Li, Na, and K hypochlorites prepared from bleaching powder soln. by pptn. with soln. of the alkali sulfates or carbonates have identical bleaching properties; the bleaching efficiencies of these solns, are almost equal to that of the original bleaching powder soln. Curves showing (1) the evolution of O from hypochlorite solns. and from solns. of Na_2O_2 in contact with Cu oxide; (2) the rate of bleaching of soln. of hypochlorites and of Na_2O; (3) the rate of oxidation of oxalic acid by $KMnO_4$ and the rate of liberation of I from Kl by acidified N_2O_2 soln. (Harcourt and Esson, Phil. Trans., 1866, 156, 193) point to the conclusion that the action on all of these cases are similar, i.e., unimolecular. Hypochlorites, therefore, bleach because of their readiness directly to produce nascent O. Those substances which accelerate the evolution of O from solns. of hypochlorites or of peroxides also assist the evolution of that gas when they are heated along with $KClO_3$. Cl water is a much weaker bleach-

ing agent than soln. of hypochlorites. Cl water owes its bleaching power to HClO.

144. Ger. 279,993, Oct. 5, 1913. A. Lehmann. Malt or malt prepns. are added to the bleaching bath in the bleaching of cotton, artificial silk, half silk, jute, ramie, hemp, sisal, half linen, wood, nettle, with the use of $CaOCl_2$, NaOCl, elec. prepared bleaching soln., or HClO. The specified addition increases the activity of the Cl.

145. Fractional Bleaching of Cotton and Other Vegetable Fibers. J. Korselt. Ger., 287,240, Nov. 21, 1913. Hypochlorite solns. are used, of concns. steadily increasing with the progress of the bleaching process, omitting the bucking process and avoiding additions of any kind. The fiber is bleached satisfactorily without injury to the material, loss of spinning qualities, or of wt. The formation of oxycellulose is prevented.

146. U. S. 1,135,303, Apr. 13. A. Lehman. Bleaching solution formed of chloride of lime and kromocon or similar malt preparation. The latter increases the rapidity of the bleaching effect of the Cl.

147. U. S. 1,023,287, Apr. 16. H. Wilsing. Making bleaching liquors by chlorinating alk. hydroxides and carbonates.

148. U. S., 992,133, May 9. Eugene D. Jefferson, Lowell, Mass. Bleaching cloth by subjection to bleaching liquor in a closed vessel and aerating the liquor during the operation, the air being utilized to cause an intermittent circulation of the liquor through the goods.

149. The Stability of Bleaching Powder. Dr. Richard Schwarz. *Farber-Ztg.* 19, 3-4.—In a bleachery, using about one cask of bleach per week, it was noticed that the results were more or less irregular, although the bleaching-powder was of good quality when first opened and was always used in the same way. The trouble was traced to deterioration when kept in open packages exposed to the air. In the experiments cited the original strength was 31.65% available chlorine. The carefully covered and protected bleach lost only about 0.2 to 0.3% in two weeks, while the unprotected lost 1.25% during the same period, enough to be noticeable in the bleaching process.

150. Hypochlorite and Elektrishe Bleichen Praktischangewardter Teil. W. Ebert, and J. Nussbaum. Halle a/S. 18 M. Frois, M.: *Les Blanchisseries.* 8°, 192 pp., 7.50 Fr.

151. Ger. 199,283, June 29, 1907. Emil Gminder, Reutlingen. Apparatus for making a bleaching liquid by the solution of chloride of lime in H_2O, or the like.

152. Ger. 176,609, Apr. 30, 1905. Ludwig Pick and Franz Erban, Nachod (Bohmen). Process of bleaching plant fibrins, characterized by a treatment with mixtures of alkaline hypochlorite, finally nearly free alkalies or alkaline reacting salts, and substances increasing the capillarity, as Turkey red oils or castor oil soaps.

153. Ger. 233,211, Apr. 22, 1910. Kalle & Co., Akt.-Ges. Bleaching the white in printed cotton by means of hypochlorite solns. In order to avoid affecting the colored parts of the material, soda lye is added to the chloride of lime bath.

(To be continued)

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NEWS

VOLUME 39 OCTOBER 30, 1950 NUMBER 22

Berthold A. Ludwig

• Berthold A. Ludwig Dies at 79

Berthold A. Ludwig, 79, president of National Aniline Division, Allied Chemical & Dye Corporation for twenty years prior to his retirement on October 1, 1950, died after a long illness on October 8 at Westfield, New Jersey.

Educated in Germany as a chemist, Mr. Ludwig came to this country in 1890 to enter the dye application laboratory of Schoellkopf, Hartford and Hanna, Buffalo, N. Y. After several years of practical dye house experience, he became connected with William J. Matheson & Co., Ltd. and was Technical Director of its successor, the Cassella Color Company, for 10 years.

In 1918 Mr. Ludwig became Vice-President in charge of Sales, National Aniline & Chemical Co., Inc., and subsequently in 1930 became successively Assistant to the President, Allied Chemical & Dye Corporation, and then President of National Aniline Division. In all, Mr. Ludwig was an active leader in the technical development, production and application of dyestuffs for over 60 years, of which 53 years were devoted to National Aniline and i s predecessors.

Mr. Ludwig also made substantial contributions to the establishment and growth of the American synthetic detergent industry. Traveling in Germany during the Summer of 1929, he discovered a then-obscure organic chemical, Gardinol; recognized its detergent possibilities and procured rights for its introduction into this country. Later, under his direction, National Aniline undertook a fundamental research program on petroleum-based synthetic detergents. From this work came the Nacconols, alkyl aryl sulfonates, which today represent one of the most important class of detergents in America.

• Hilton-Davis Names Vilar Mexican Textile Agent

Hilton-Davis Chemical Company Division, Sterling Drug Inc., has appointed Vilar Brothers y Mejia, Mexico City, agent for sale of its dyestuffs and intermediates to the textile industry in Mexico, marking the first time Hilton-Davis had entered the Mexican textile field. Manuel Martinez C., Mexico City, continues to represent Hilton-Davis in sales to the paint and printing ink industries.

Arrangements are being completed for stocking supplies in Mexico City, where the Vilar firm has headquarters at Apd. No. 118-V. Carranza 65 D. F. Juan B. Vilar is in direct charge for Hilton-Davis. Associated with him are Jose Vilar, president, and R. Mejia.

• New Multi-Million Dollar Synthetic Fiber Plant

Plans for the construction of a multi-million dollar plant to manufacture a new synthetic fiber for the Chemstrand Corporation have been announced by American Viscose Corporation and Monsanto Chemical Company, joint owners of the Chemstrand Corporation. Plans call for the plant to be erected on a 656-acre site west of Decatur, Ala., on the Tennessee River.

Simultaneously, it was announced that Chemstrand will shortly begin the operation of a synthetic fiber semi-production plant at Marcus Hook, Pa., where a million pounds of synthetic fiber staple will be produced annually. Up until now, the acrylonitrile-type fiber has been produced only in laboratory quantities.

No details were given concerning the size of the Alabama installation, but it was announced that construction would get under way next year. The plant site is bounded on three sides by the Wheeler Reservoir of the Tennessee River, and on the south by State Highway 20.

It is reported that Chemstrand's new synthetic fiber will be manufactured only in staple form in its initial stages. The fiber, of very low specific gravity, will tend to offer warmth in light-weight suitings for men and women.

Formation of the Chemstrand Corporation was announced May 5, 1949, by American Viscose Corp. and Monsanto Chemical Co. Dr. Carroll A. Hochwalt of St. Louis, a Monsanto vice president, is president of the new corporation.

The announcement of the Decatur site and Marcus Hook semi-production plant is closely related to and part of Monsanto's plan concerning the establishment of an acrylonitrile plant at Texas City, Texas.

Officers of Chemstrand, in addition to Dr. Hochwalt, are Dr. Charles S. Venable of Philadelphia, director of chemical research for American Viscose Corporation, who is vice president of the new corporation, and F. William Koster of Philadelphia, also of American Viscose Corporation, who is secretary-treasurer.

The following are members of Chemstrand's board of directors: William M. Rand of St. Louis, president of Monsanto Chemical Co.; Dr. Charles Allen Thomas, also of St. Louis, Monsanto executive vice president; Dr. Hochwalt; Charles S. Chesston of Philadelphia, Monsanto board member; Dr. Frank H. Reichel of Philadelphia, chairman of the board and president of American Viscose Corporation; Dr. Venable; Edgar M. Queeny of St. Louis, chairman of Monsanto Board; Charles S. McCain of New York, president of Dillon, Reed and Company and a director of American Viscose Corporation; William Ewing of New York, partner of Morgan, Stanley and Company, and a director of American Viscose Corporation, and John G. Jackson of New York, partner of the legal firm of Jackson, Nash, Brophy, Barringer and Brooks, who is also a director of American Viscose Corporation.

• Walker Elected DCAT Chairman

Charles P. Walker, Jr. (Director and General Sales Manager, Chas. Pfizer & Co., Inc.) has been elected Chairman of the Drug, Chemical and Allied Trades Section of the New York Board of Trade (DCAT) at its 60th Annual Meeting. Other officers in addition to Mr. Walker who will serve during the next fiscal year are: Vice-Chairman—Charles M. Macauley, Vice Pres., Pro-phy-lac-tic Brush Co.; Treasurer—Hugh S. Crosson, McKesson & Robbins Inc. (re-elected); Secretary—Helen L. Booth (re-elected). James G. Flanagan, Vice Pres., S. B. Penick & Co., was appointed Counsel. The DCAT, composed of approximately 700 leading manufacturers and distributors of drugs, chemicals and related products, met at Shawnee-on-Delaware, Pa., September 21-23. A new Executive Committee, elected at the Friday afternoon business session (Sept. 22), met at a special breakfast meeting Saturday morning (Sept. 23) to elect officers.

The retiring Chairman, Harold C. Green, L. Sonneborn Sons Inc., was elected Section Representative to the Board of Directors of the New York Board of Trade at Friday's meeting.

The personnel of the new Executive Committee (exclusive of officers) follows: Murray Breese, Murray Breese Associates; Ralph A. Clark, J. T. Baker Chemical Co.; Stanley I. Clark, Sterling Drug Inc.; Harold F. Cummings, Vitamerican Oil Corp.; Donald S. Cushman, Innis, Speiden & Co.; Russel J. Fosbinder, The Maltbie Laboratories, Inc.; Claude A. Hanford, Pharmaco, Inc.; J. David Hayden, Gelatin Products Div., B. P. Scherer Corp.; Wm. W. Huisking, Chas. L. Huisking & Co., Inc.; J. Wayne Luther, The Mennen Company; George S. McMillan, Bristol-Myers Company; W. Boyd O'Connor, Ayerst, McKenna & Harrison, Ltd.; Fred G. Singer, E. I. du Pont de Nemours & Co.; Sydney N. Stokes, Merck & Co., Inc.; Stephen F. Urban, E. R. Squibb & Sons; Lloyd I. Volckening, The Ivers-Lee Company.

• Phi Psi Faculty Advisors Conference

Harold W. Whitcomb, Divisional Vice President, and Richard Tuttle, Director of Research for Fieldcrest Mills, Spray, N. C., recently became honorary members of Phi Psi Fraternity, national textile society, at a faculty advisors meeting held at the Fieldcrest Mills Lodge at Fieldale, Va., Sept. 6-10.

A committee to study textile magazines and publish reviews of leading articles in the Phi Psi Quarterly was appointed at the meeting. Action was taken on matters enhancing opportunities of textile college graduates as well as subjects of general textile interest.

Addresses made at the meeting by executives of Fieldcrest and professors of textile colleges will be published in future issues of the Quarterly, it is reported.

Those present were:

Earl Heard, Vice Pres. of West Point Mfg. Co. and Pres. of the Grand Council, Mortimer T. Farley, Farley Harvey Co., Boston, Mass. Treas. of the Grand Council, Harold H. Hart, Wolfeboro, N. H., Exec. Sec., Prof. James Giblin, New Bedford Textile Institute, Vice Pres. of Grand Council, Prof. William Wingate, Bradford Durfee Technical Institute, Fall River, Mass., Prof. Milton Hindle, Lowell Textile Institute, Prof. Percival Theel, Philadelphia Textile Institute, Prof. Thomas R. Hart, North Carolina State College, Prof. Edmund J. Dupre, New Bedford Textile Institute, Prof. J. W. McCarty, Ga. Institute of Technology, Prof. Wm. G. Blair, Clemson College, S. C., and Prof. Wm. C. Knight, Ala. Polytechnic Institute, Auburn, Ala.

Dr. William A. Endriss

• Endriss to Sell Mathieson Rug Cleaning Compounds

Endriss Chemicals of Philadelphia, Pa., headed by Dr. William A. Endriss, has been licensed by the Mathieson Chemical Corporation to manufacture and sell its Chromotex and Neutrotone rug cleaning compounds. Dr. Endriss was formerly director of Rug and Carpet Cleaning Research for the National Institute of Cleaning and Dyeing.

• Morningstar Opens Charlotte Office

The opening of a sales and technical service office at 825 W. Morehead St., Charlotte, N. C. has been announced by Joseph Morningstar, President of Morningstar, Nichol, Inc., producers of starch dextrine and synthetic resin sizings and chemical specialties.

The products of the parent company and its subsidiaries (including Paisley Products, Inc., suppliers of glues, pastes and resin cements) will be handled in the Carolina area, as well as parts of Virginia, Georgia and Eastern Tennessee by a staff of three.

Frank Martin will specialize in the Morningstar line of tapioca flour, potato starch, corn dextrine and dry adhesive products. Milton F. Lenz will handle the Paisley line and Lee Kritzer will provide technical sales on sizings, oils, softeners and related specialties.

• Marshall Urges Greater Wool Production

By "promoting the sale of mutton instead of lamb in the United States" Jule F. Marshall, president of the Felt Association and vice-president of the American Felt Company feels that meat packers can help the nation's wool production by allowing sheep to mature and grow more wool.

Before the Felt Association's annual fall meeting, Sept. 21-23 at Oyster Harbors, Oysterville, Mass. Mr. Marshall told his audience that "felt mills are producing to capacity" and have reached the saturation point. "Since the world is requiring 25% more wool than is grown," he stated, "a condition arises about which something should be done and the meat packers are the logical ones to cooperate in starting such a movement".

On a recent trip to the Pacific Coast and Alaska, Mr. Marshall discussed the subject with wool experts at the Western Regional Research Laboratory at Albany, Cal. as well as wool growers and users in California, Oregon and Washington.

• QCPC Expands Conshohocken Facilities

With a large increase in business reported by the Quaker Chemical Products Corporation, contracts have been given out and orders placed for the installation of new boilers and boiler house to take care of the expanded requirements placed on their Conshohocken, Pa., plant.

Construction of the new boiler house, which will give almost three times the boiler capacity now available, reportedly will be completed before the end of the year and the boiler installation completed by early 1951.

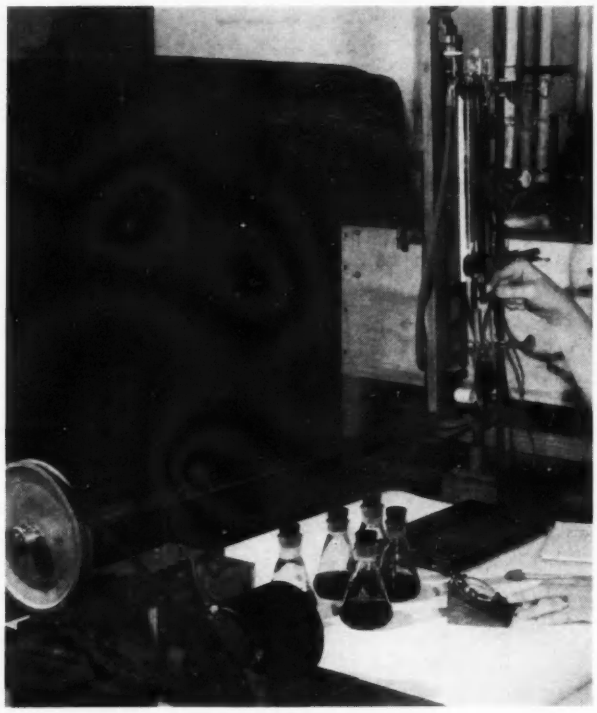


Figure 1

Equipment Used in Simplified Viscosity

Erlenmeyer flasks containing cellulose dissolved in reagent have just been removed from the motor-driven agitator bar. The solution is run through the viscometer, right center, which is enclosed in a jacket through which water is pumped from the constant-temperature bath at the right.

• Simplified Viscosity Test for Cellulose

An improved method for determining the quality of cellulose, a simplification of the cuprammonium viscosity determination, which is widely used as an aid in determining the effect of light, heat, and chemical reagents on the cellulose in paper and textiles, has been devised by H. F. Launer and William K. Wilson of the National Bureau of Standards*. The procedure is said to be advantageous in ease of preparation of the cuprammonium reagent and reduction in sources of error during the reaction.

The cuprammonium reagent is first prepared by dissolving solid cupric hydroxide in ammonium hydroxide in an ice bath, thereby making storage unnecessary. Cellulose is then dissolved in the reagent, with the addition of cuprous chloride and copper wire to prevent air oxidation. Rubber-stoppered Erlenmeyer flasks are reported convenient for this purpose and mechanical agitation facilitates the process. The time of flow of the resulting solution is measured in a glass jacket, through which water is pumped from a constant-temperature bath.

The Bureau reports that (1) the procedure saves time and labor and (2) the results compare favorably with those obtained by the older method.

* For further technical details, see "Preparing Cuprammonium Solvent and Cellulose Solutions," by H. F. Launer and W. K. Wilson, *Anal. Chem.* 22, 455, (1950). Dr. Launer is now associated with the Western Research Laboratory, U. S. Department of Agriculture, Albany, California.

• Nichols Medal to Eyring

The William H. Nichols Medal of the American Chemical Society's New York Section has been awarded to Dean Henry Eyring of the University of Utah Graduate School for 1951, according to a recent announcement by Dr. Raymond E. Kirk, chairman of the award jury. Presentation of the medal will take place at a dinner meeting of the New York Section on March 9, 1951.

Dr. Eyring, a foremost theoretical chemist and an authority on textile chemistry, receives the medal "for his outstanding contributions to the field of theoretical chemistry, which clarified the theory of rate processes." He was a member of the Princeton University faculty from 1931 to 1946 and research director of the Textile Foundation from 1944 to 1946.

• 20 NEFT '51 Scholarship Awards

Up to 20 textile scholarships worth $2,000 each will be awarded by the New England Textile Foundation, Providence, R. I., in 1951.

Payable at the rates of $250 per semester or $500 per year for four years, the scholarshitps may be used at Bradford Durfee Technical Institute, Fall River, Mass.; Lowell Textile Institute, Lowell, Mass.; New Bedford Textile Institute, New Bedford, Mass., and Textile School of Rhode Island School of Design, Providence, R. I.

Students, who must qualify on the basis of high school records and marks received in a competitive examination, may choose any of the four colleges.

To compete for the awards, seniors in high school and high school graduates not over 25 years of age should write to the Foundation for application blanks and a scholarship booklet. All applications and principal's reports should be forwarded to the Foundation by Dec. 11, 1950. The exam will be held March 10, 1951 in various parts of the country.

• Adams-Henry Chemical Company Formed

The Adams-Henry Chemical Company, Inc., a new organization which will act as selling agents and distributors of industrial and fine chemicals, intermediates and dyestuffs, has been formed by John F. Henry and Halstead J. Adams. Their offices are located at 32 Broadway, New York, N. Y.

Both men were formerly with Joseph Turner & Co. Mr. Henry was Vice President and Director with 20 years service. Mr. Adams was manager of the New England office; he was associated with Turner for 15 years.

• Eight Nations Exhibit at Textile Recorder Show

Principal machinery producers of eight nations displayed their products at the recent International Exhibition of Knitting Machinery and Accessories, Granby Halls, Leicester, England.

The exhibition, staged by the British textile machinery manufacturers through their own nonprofit organization and sponsored by *Textile Recorder*, attracted visitors from at least 53 nations, it is estimated. Officials state that in consequence of the show, the first of its kind to be held in England in 14 years, large orders are now being booked.

• Program for 21st TRI Annual Meeting

Following is the program for the twenty-first annual meeting of the Textile Research Institute to be held November 16-17 at the Waldorf-Astoria Hotel, New York, N. Y. The Institute's laboratories at Princeton, N. J. will be open for inspection Saturday, Nov. 18. Exhibits in the Astor Gallery will be open from 9-6 on Thursday (Nov. 16) and 9-5 on Friday (Nov. 17) featuring recent developments in laboratory control and testing instruments. Advanced reservations for the meetings may be made through the Textile Research Institute, Inc., Princeton, New Jersey.

TECHNICAL SESSION

Thursday, November 16—Jade Room.

Chairman of the Day—John H. Dillon, Director of Research, Textile Research Institute.

9:00 A.M. Registration.

10:00 A.M. Morning Session.

1. "Certain Aspects of Yarn Structure"—E. R. Schwarz, Professor of Textile Technology, Massachusetts Institute of Technology.
   Discussion: Chairman, Walter J. Hamburger, Director, Fabric Research Laboratories, Inc.
2. Dyeing Under High Temperatures"—Harold J. Walter, President Bachmann Uxbridge Worsted Corporation.
   Discussion: Chairman, George L. Royer, Assistant Director of Physical Chemical Research, Calco Chemical Division, American Cyanamid Company.
3. "The Spinning Value of Raw Cotton"—William E. Morton, Professor of Textile Technology, Manchester College of Technology, Manchester, England.
   Discussion: Chairman, Joseph H. Brant, Director of Research, The Toni Company.

12:45 P.M. Luncheon in honor of visiting British Textile Educators.

Address—"The Plasticity of Wool—Its Theoretical and Practical Significance"—J. B. Speakman, Professor of Textile Industries, Leeds University, Leeds, England.

2:30 P.M. Afternoon Session.

"The Copper Technique for Dyeing Acrylonitrile Fibers"—T. A. Field, Jr., and G. H. Fremon. Presented by G. H. Fremon, Research and Development Department, Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation.
Discussion: Chairman, Robert W. Work, Central Research Laboratory, Celanese Corporation of America.

"Strength and Weakness in Cotton Fibers" by H. R. R. Wakeham, Textile Research Institute.
Discussion: Chairman, John P. Elting, Director of Research, Kendall Mills, Division of The Kendall Company.

"Product and Process Changes as Related to Degree of Fiber Crimp" by L. W. Rainard, Assistant Director of Research, Alexander Smith and Sons Carpet Company.
Discussion: Chairman, Milton Harris, President, Harris Research Laboratories.

GENERAL SESSION

Friday, November 17—Grand Ball Room

Chairman of the Day—Donald H. Powers, Director of Applied Research, William R. Warner and Company, Inc.

9:00 A.M. Registration.

10:00 A.M. Morning Session.

SYMPOSIUM ON PERFORMANCE AND SERVICEABILITY OF FABRICS

The current program to improve the performance of fabrics:

"Fabrics of Natural Fibers"—Giles E. Hopkins, Technical Director, The Wool Bureau, Inc.

"Fabrics of Synthetic Fibers"—Julius B. Goldberg, Director of Research, J. P. Stevens and Company, Inc.

The serviceability of the newer fabrics:

"Serviceability in Laundering"—George H. Johnson, Vice President, The American Institute of Laundering.

"Serviceability in Dry Cleaning"—George P. Fulton, Research Director, National Institute of Cleaning and Dyeing.

1:00 P.M. Luncheon.

1. Report of President, A. G. Ashcroft, Director of Research, Alexander Smith and Sons Carpet Company.
2. Address: "From Adam to Atom"—Floyd W. Jefferson, Sr., Co-Chairman of the Board of Directors, Isetin-Jefferson Company, Inc.

OPEN HOUSE

Saturday, November 18
Textile Research Institute Laboratories
Princeton, New Jersey

The Staff of the Institute will be present to discuss techniques and equipment used in connection with TRI's current research program.

Bus transportation will be provided between the Waldorf-Astoria Hotel and the Laboratories. Guests will leave New York at 9:00 A. M. and return about 4:00 P. M.

In addition to the inspection of the Laboratories, the program will include a brief guided tour of the Princeton University campus and a luncheon at the Princeton Inn.

• 20 Appointed to PTI Board of Governors

Rinaldo A. Lukens, President of the Philadelphia Textile Institute, recently made 20 appointments to the Institute's Board of Governors. The Board is responsible for the conduct of the educational functions of the Institute and the operation and maintenance of the physical plant. The following received appointments:

Frederic H. Barth, Industrial Rubber Company, Philadelphia; G. W. Bendigo, Textile World, New York; Leon P. Brick, Onyx Oil and Chemical Company, Jersey City; J. Marshall Cole, Cold Spring Bleachery, Yardley, Pa.; David S. Cook, Clinton Cotton Mills, Clinton, South Carolina; Edwin L. Dale, Haverford, Pa.; Clarence L. Ederer, Ederer, Inc., Philadelphia; Howard P. Galloway, Plainfield, N. J.; Wm. T. Galey, III, Aberfoyle Manufacturing Company, Philadelphia; Horace T. Greenwood, Globe Dye Works, Philadelphia; M. Earl Heard, West Point Manufacturing Company, Shawmut, Alabama; Gerome Leonard, Gerome Leonard Company, New York; Carl C. Mattmann, Stonecutter Mills Corporation, New York; Wm. J. Maurer, F. W. Maurer and Sons Company, Philadelphia; Morrison B. Orr, Orr Felt and Blanket Company, Piqua, Ohio; Edgar Schlesinger, United Merchants and Manufacturers, Inc., New York; Joseph Schmitz, Jr., Universal Dye Works, Inc., Philadelphia; Richard B. Stehle, Brehm and Stehle, Philadelphia; Paul Whitin, Jr., Stone Quarry Farm, North Berwick, Maine; Frank P. Zurn, Alco-Zander Company, Philadelphia.

• Allyl Starch Price Drop

A second drop in the price of allyl starch for 1950 has been made possible by General Mills Research Laboratories, Minneapolis, due to increased sales, according to an announcement by M. H. Baker, in immediate charge of the product's field evaluation. Introduced to industry by General Mills in 1947, allyl starch is an unsaturated ether of starch formed from starch and the petroleum derivative, allyl chloride.

In tankcar quantities, a 40% solids solution of the resin in toluene now sells for 24 cents a pound; in shipments of 43 drums—25.5c/lb.; in 5 drug lots—26.25c/lb. and in single drum amounts at 26.75 cents. The tankcar price for alcohol solutions has been lowered to 28.75 cents. For those shipped under water, the lowest price on the scale is 51 cents/lb. as compared with the less than drum price of 58 cents.

NEW PRODUCTS

• Electrolytic Plant to Obtain Caustic Soda and Chlorine

A special electrolytic plant for obtaining caustic soda and chlorine locally in required quantities through the conversion of common salt has been devised by Amroc, Inc., 280 Broadway, New York 7, N. Y. The unit occupied a space 3½′ x 25′ and is shipped fully assembled. The chlorine produced may be automatically converted for sale as a by-product by using auxiliary apparatus connected to the unit assembly, such as the automatically operating absorptive tower (to produce calcium hypochlorite or a small unit to produce hydrochloric acid.

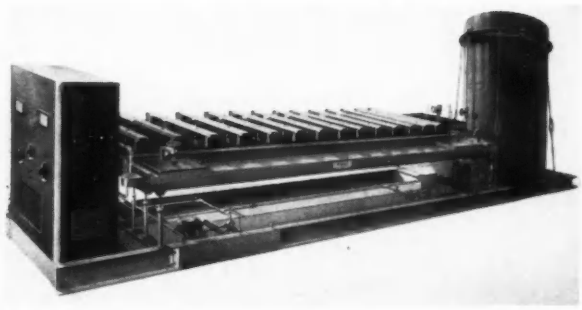
A highly developed mercury cell complete with denuder, a power rectifier, brine preparation tanks (arranged vertically), brine recirculation equipment, a caustic receiving tank, etc. go to make up the unit, called the "Amroc Packet Plant". All are mounted on a single foundation.

Output for the Packet Plant is reported to be not less than 225 lbs. of 100% caustic soda, 200 pounds of chlorine, and 5 pounds of hydrogen over a 24 hour period. Daily output of either calcium or sodium hypochlorite in a 5½% solution is reported at 400 gallons, with necessary auxiliary equipment. 65 gallons in addition to the caustic soda is the figure quoted for the daily production of hydrochloric acid in a 36° Baumé concentration, using chlorine and hydrogen.

Both the caustic soda and the chlorine produced are said to be of very high quality. The salt-free caustic soda is produced in liquid form in concentrations up to 50% without evaporation or use of steam, it is stated. The chlorine is said to have a concentration of 98-99% with an average of less than 0.5% CO_2.

Economic operation from the standpoint of power consumption is also reported to be good. The plants may be operated at varying speeds (from 20-130% of the normal rate), the speed being controlled by a governor. This is suggested by the manufacturer to take full advantage of the power demand charge usually paid for electric current.

Information on Amroc's small unit plant may be obtained by requesting bulletin No. 7. Write Amroc, Inc., 280 Broadway, New York 7, N. Y.

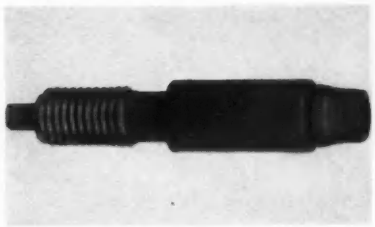


Amroc Packet Plant

• Indanthrene Printing Red BA Extra Paste Fine

General Dyestuff Corporation has released circular G-657 on Indanthrene Printing Red BA Extra Paste fine, a vat dyestuff manufactured and standardized especially for printing (see "Technical Literature" section). GDC reports that "it produces bright, full, red prints with a slightly bluish cast on both cotton and rayon with very good to excellent fastness to light (6-7), very good to excellent fastness to washing (4-5) and excellent (5) fastness to chlorine (0.3% solution of active Cl_2). A bright red of such excellent fastness to light, washing and chlorine is useful not only for draperies, upholstery materials, and curtains where fastness to light is requisite, but also for wash-fast dress materials and shirtings, especially where small patterns are involved."

As a paste the product should be convenient for the printer in that it is reported to be smooth-flowing, nonsettling, grit- and speck-free. As a nondrying type it retains these properties even when left exposed to the air and does not form brittle incrustations, the company reports. A further advantage claimed for this paste is its resistance to freezing.



Spindle from a 1" Size Impervious Graphite Valve After 2 Year's Service

• Impervious Graphite Globe Valves

Corrosion and binding problems with metal spindle threads are reported eliminated in "Karbate" impervious graphite globe valves, manufactured by National Carbon Division, Union Carbide & Carbon Corporation, 30 E. 42nd St., New York 17, N. Y. Threads on the bonnet and spindle are self-lubricating and corrosion resistant. The ability of the spindle threads to stand up under continued use is illustrated above.

• Synthrez B

Synthron, Inc., Ashton, R. I. has announced commercial scale production of Synthrez B, another in its line of polymerized urea-formaldehyde solutions. The product, a clear, thin liquid, readily soluble in water in all proportions, is used for durable finishes and shrinkage control effects. Owing to its carefully controlled polymerization, it makes possible the production of shrinkage controlled finishes without excessive stiffening of the fabric, the company states. They further state that with Synthrez B, curing is much more effective and complete than in the case of certain modified resins.

Specifications are:

Appearance: Clear, colorless syrupy liquid.

Active Content: 52-53%.

pH @ 25°C.: 7.5-8.0.

Viscosity @ 25°C.: 30-40 centipoises.

Free Formaldehyde: Less than 5%.

Specific Gravity @ 25°C.: 1.18.

Weight per Gallon: 9.85 lbs.

Cured Resin Yield (150°C): 40% approx.

For general usage, 1% to 5% of Synthrez B is suggested by the company, together with appropriate catalysts. Curing, washing and dimensional control during finishing are analagous to the conventional urea-formaldehyde procedure, it is stated. Further details may be obtained from the manufacturer.

• Sodium Cellulose Sulfate

Highlighting Tennessee Eastman's exhibit at the recent National Chemical Exposition was a new water soluble cellulosic, Sodium Cellulose Sulfate (SCS), made by treating cellulose fibers with sulfuric acid and other reagents. The resulting granular product can readily be dissolved in hot or cold water, it is reported.

As SCS is added to water, the viscosity of the solution is said to increase rapidly. The company states that a solution containing only 2 to 3 per cent of SCS is so thick and syrupy that it can hardly be poured from its container; if such a solution is distributed evenly over a smooth plate and the water present removed by evaporation, a clear, strong, grease-proof, nonburning film is produced.

Tennessee Eastman feels that the new cellulose gum will be useful in a number of fields including detergents and textiles. Addition of SCS to washing compounds should improve their effectiveness, the company states, by preventing redisposition of soil already removed. This is accomplished by holding the soil particles in suspension. As a sizing agent SCS holds promise as a fiber protector during weaving. Fabrics may be coated with the product to produce a chintz-like finish, which in turn can be given resistance to laundering by treatment with reagents such as glyoxal or formaldehyde, it is claimed. Laces and other woven effects reportedly can be produced by using fibers spun of SCS for temporary support. When the weaving is complete the SCS fibers can be dissolved.

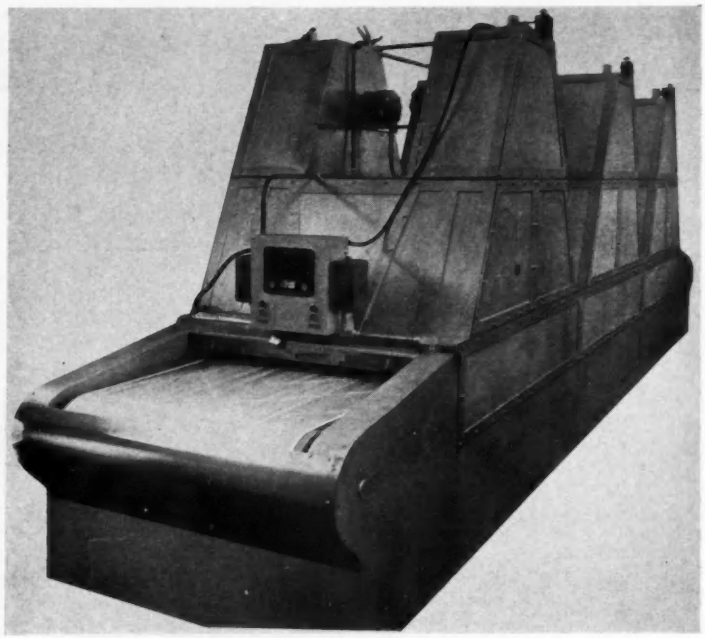
• Catalyst AC-4

Catalyst AC-4, for use in resin baths of both urea and melamine types, has been developed by the textile chemicals department of Monsanto Chemical Company's Merrimac Division. As applied to textiles, the product promotes resin polymerization and fixation during curing operations, according to E. W. Gamble, Jr., textile chemicals director.

Monsanto's catalysts for textiles also include Catalyst AC and AC-2, used in the resin bath to keep it stable.

• Turbo Crimper

A standardized machine for putting crimp in nylon and other synthetic fibers is now being put into production by Turbo Machine Company, Lansdale, Pa., according to an announcement by H. W. Matthews, vice-president. The "Turbo Crimper", powered by a 1½ H.P. motor, is said to be compact, simple in operation and easily incorporated in the production line of most mills. It has been in operation experimentally in several plants for the past year. Delivery is 6 to 8 weeks.



Smith, Drum Nylon FF Hosiery Finishing Machine

• Machine for Finishing all Nylon FF Hosiery

A new nylon stocking finishing machine which is said to eliminate final boarding has been developed by Smith, Drum & Co., Philadelphia, Pa. According to the firm the machine increases finishing production per operator four to five times over usual rates and increases the percentage of first-quality goods, because no forms are required.

Smith, Drum states, in its announcement, that in a recent test a machine was installed in Berkshire Knitting Millls, and three operators (with only two days' experience) finished 1,200 dozen pairs of 15-denier stockings in eight hours.

In using the new machine, the mill carries out the preboarding, dyeing and extracting operations as normally. Then, instead of final boarding of the hosiery individually on forms, the stockings are delivered to the feed end of the new machine, still in the hosiery nets.

The machine includes a traveling conveyor belt passing through a drying cabinet with controlled temperature and air currents, it is stated.

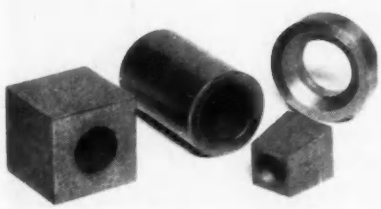
Each machine has three operators. The first removes and opens the folded goods from the dye net; the second places an open bundle of 12 stockings full length on the conveyor belt, and the third removes the bundle at the delivery end, placing them on carrier boards for delivery to the pairing and inspection departments.

Universal Dye Works, Philadelphia, worked with Smith, Drum on the original machine and it was installed in their plant a year ago. Applications have been filed with the U. S. Patent Office for patents on both the machine and the method of handling hosiery, it was stated. Universal will process sample lots of hosiery.

• Angara Immersion Bearings

For application where heat or liquid immersion make permanent self-lubrication necessary, Angara, Inc., 282 Farragut Pkwy., Hastings-on-Hudson, N. Y., have produced chemically inert composition-graphite bearings. It is stated that these low friction, high strength bearings will not affect or be affected by the solutions in use, will run dry as well as immersed and eliminate shaft wear.

Angara, Inc. recommends the immersion bearings, which can be supplied in any size or shape, for use in jigs, washers, padders, steamers, ovens, dryers, curers, sizers, etc.



Graphite Immersion Bearings—Rotary Steam Steel Ring

• 1,4-Butanediol

1,4-butanediol, a new addition to the glycol series has been made available in pilot plant quantities by the Industrial Chemicals Department, Antara Products, General Aniline & Film Coropration, 444 Madison Ave., New York 22, N. Y. The product, a saturated glycol with a molecular weight of 90.1, is said to possess humectant properties. It is also reported compatible with casein, animal glue and gelatin. Among the suggested uses are: rayon lubricant, warp-size component, additive for sizing and finishing baths, and softener.

Polyurethans prepared from 1,4-butanediol are reported to have high tensile strength, hardness and low water absorption. Polyesters obtained by reaction of 1,4-butanediol with suitable dibasic acids reportedly are outstanding as plasticizers for polyvinyl chloride or vinyl chloride-vinyl ester copolymers because of resultant low cold crack coupled with low volatility. The polyesters are also reported to be well regarded as lacquer raw materials and artificial resins. Esters of dibasic acids with 1,4-butanediol and aminoglycols have been described as good softening agents for cellulose acetate or regenerated cellulose fibers.

A technical bulletin on the product is available. See "Technical Literature" Section.

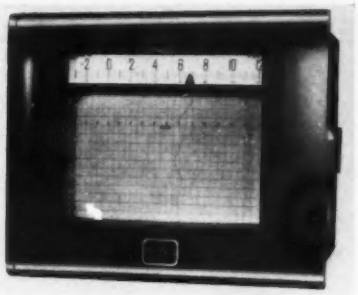
• Chemlon V-Rings

"Chemlon V-Rings", a product of the Crane Packing Company, 1800 Cuyler Avenue, Chicago 13, Ill., is the newest of that company's growing line of Teflon-fabricated packings. The V-Rings, molded from pure Teflon, are frictionless, last many times longer than conventional packing, and cause no wear on hydraulic valves, it is stated. Chemically inert and not affected by corrosive solutions, they are reported to stand temperatures up to 450°F. Crane states that even at varying operating pressures "the tough, resilient 'Chemlon V-Rings' insure a perfect permanent seal with just finger-tip pressure on the gland." The product is supplied in numerous standard sizes from stock, and in special sizes.

(See *"Packings for the Chemical Industry"* in the "Technical Literature" Section).

• Strip-Chart Dynamaster

The Bristol Company, Waterbury 20, Conn., has developed a new line of strip-chart electronic instruments (500 Strip-Chart Dynamaster Electronic Instruments).



Bristol Strip-Chart Dynamaster

The Strip-Chart Dynamaster is a high-speed, self-balancing a-c bridge designed for measurement of any variables which can be measured in terms of impedance. The instrument can also be used for electric power totalization and as the receiver for Bristol's Metameter System of Telemetering.

In addition to the single record model illustrated above, instruments are available for as many as 16 different records on the same chart.

Full descriptions of the instruments in all models as well as supplementary controllers are included in the company's bulletin No. W1821.

TECHNICAL LITERATURE

"Packings for the Chemical Industry"—Crane Packing Company, Dept. R-13, 1800 Cuyler Avenue, Chicago 13, Ill. Covers Crane's Teflon-fabricated packings including braided types, French and standard ring gaskets, extruded and machined forms, and a variety of molded shapes for packing and electrical insulation use.

"Surface Active Agents and Organic Chemical Specialties"—a catalogue by the Alrose Chemical Co., Cranston 5, R. I. giving specifications and applications. Among the new products listed are the Alrolenes, Alrosept MBC-50, Alromine RA, Alrowax 75, Alrodynes, Alrowet CA, and Alrosperse 40K.

"Amroc Small Unit Plant"—a booklet, complete with flow and process diagrams, giving complete details of Amroc, Inc.'s Small Unit Plant for producing caustic soda, chlorine, hydrogen and their derivatives. Ask for Bulletin 7, Amroc, Inc., 20 Broadway, New York 7, N. Y.

"Indanthrene Printing Red BA Extra Paste Fine"—bulletin G-657, issued by General Dyestuff Corporation, 435 Hudson Street, New York 14, N. Y. General description and application of the paste. In addition to listings of printing recipes and fastness properties on cotton and rayon, the bulletin carries mounted samples of spun rayon and cotton, the latter printed under a reduction of 1:4.

Data Bulletin No. 303—8-pages. Properties, characteristics, uses and handling information for 1,4-butanediol, a new addition to Antara Products' glycol series. It includes a chart of potential reactions as well as a complete bibliography. Available on request from Antara Products, General Aniline & Film Corporation, 444 Madison Ave., New York 22, N. Y.

"Unloading, Storage and Handling of Ethylene Oxide"—Booklet F-7618, Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y. Available at any C & C office. 16 pages. Presents procedures for unloading tank cars; discusses methods of handling and emptying the new insulated 55-lb. drums, now reportedly approved for ethylene oxide by the Bureau of Explosives, and adopted by Carbide for less than carload shipments; contains data on ethylene oxide including physical properties, explosibility limits, toxicity, specifications and shipping information. The manufacturer's recommendations for equipment necessary to handle and store ethylene oxide safely are listed. Construction details of the new drums and of the high pressure, insulated tank cars are illustrated.

Bulletin No. W1821—descriptive literature of the new line of Series 500 Strip-Chart Dynamaster Electronic Instruments produced by the Bristol Company, Waterbury 20, Conn. (See "New Products" Section).

Sodium Cellulose Sulfate—a descriptive booklet on Tennessee Eastman's new water soluble cellulosic. (See "New Products" Section). Available from Tennessee Eastman Corporation, Kingsport, Tenn.

PERSONNEL

Joseph E. Goodavage

JOSEPH E. GOODAVAGE, Huntingdon Valley, Pa., has been appointed sales representative in the Pennsylvania-Delaware-Maryland territory for Refined Products Corporation, Lyndhurst, N. J. He was with the Harnsworth Supply Co., Philadelphia, Pa., in the sales and development of sanitation and building maintenance products prior to joining RPC. A graduate of the Philadelphia Textile Institute, he was a faculty member there for a number of years before becoming officer-in-charge during World War II of the Dyeing and Chemical Finishes Section of the Philadelphia Quartermaster Depot, where he aided in the development of continuous vat dyeing of toweling and the dyeing of vat colors on tubular knit goods. After the war he was employed by Sharples Chemicals in the Textile Division to promote the sales of detergents and wetting agents.

An early advocate of the use of stainless steel in the textile industry, Mr. Goodavage lectured on its properties and textile applications before several AATCC sections while a consultant for Republic Steel Corporation. He has also been instrumental in developing methods for applying and testing mildew-proofing agents to cotton textile materials.

LUKE J. CARBONETTI, formerly Supervisor of Finishing, Old Fort Division, Clearwater Finishing Company, Old Fort, N. C., is now supervisor of Finishing, Rock Hill Printing & Finishing Company, Rock Hill, S. C.

VIRGIL C. WILLIAMS, newly appointed Associate Director of General Aniline & Film Corporation's Central Research Laboratory at Easton, Pa., will also be in charge of Chemical Engineering development. He was formerly head of the Chemical Engineering Department at Northwestern University.

S. F. Coneybear

The board of directors of Evans Research and Development Corporation at a recent meeting elected S. F. CONEYBEAR and E. C. KENTON vice presidents. Mr. Coneybear for the past five years has been development manager of the corporation. Mr. Kenton has been responsible for government research. Both will continue to serve in their present capacities.

E. C. Kenton

Changes in American Dyewood Company's Philadelphia office set-up have seen CHARLES J. CARROLL, senior salesman in Philadelphia for 40 years, elevated to the post of manager.

To assist Mr. Carroll, STANLEY SCHULTZ has been moved from the Chattanooga district. Mr. Schultz formerly covered the territory through Tennessee, Georgia and the Ohio Valley. He will continue to call in Tennessee and Georgia as well as the Carolinas and Pennsylvania. The Ohio Valley territory will be taken care of by HOWARD B. SIMMONS and WARREN J. NORTON in the Chicago office.

Atlas Mineral Products has announced that ROBERT P. DESCH will join the company as a research chemist on September 11. Mr. Desch received a B.S. at Muhlenberg and a master's degree at Williams, where he also served as a graduate assistant. Simultaneously the company announced the promotion of GEORGE GABRIEL from plant engineer to assistant plant manager. Mr. Gabriel is a Pennsylvania State College graduate.

HARRY KLINE, Detroit, Manager and Technical Director of the Phenolic Plastics Division of Reichhold Chemicals, Inc., Detroit and T. S. HODGINS, Seattle, Manager of RCI's Pacific Northwest Division, have been elected vice presidents of the company, in charge of their respective divisions.

P. L. SWISHER, Detroit, Vice President in Charge of Sales and Advertising, and M. W. REECE, South San Francisco, Vice President in Charge of Pacific Coast Operations, have been elected to the company's board of directors.

OBITUARY

William Persson Hall

DR. WILLIAM PERSSON HALL, prominent chemist and a member of the AATCC since 1936 died on June 7, 1950 in Wilmington, Del. Dr. Hall's chief contributions to the textile field came during his employment with Joseph Bancroft and Sons Co., where he developed the "Everglaze Chintz" finish and directed operations on the development of a flameproof material called "Ban-Flame", which was ultimately used by the U. S. Army. Several chapters of Robert W. Little's book "Flameproofing of Textile Fabrics" were contributions of Dr. Hall. He was also prominent in work which produced the U. S. Army's Water Bag.

Born in Copenhagen, Denmark, on Dec. 31, 1903, Dr. Hall received his early education in that city. He came to the U. S. at 18 and received his A.B. degree from Occidental College in 1931. His graduate work was done at Johns Hopkins University. He began work with Bancroft in 1936 and was soon promoted to Chemical Director, a position which he held until his death.

William Persson Hall

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NAVY BLUE NTP EXTRA PASTE

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- Cushioning of the leather

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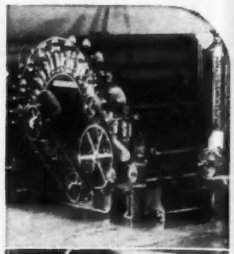

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Nopco FUA assures:

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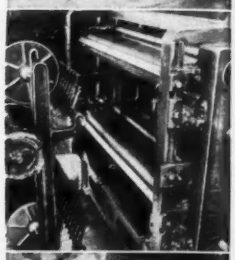
- Fewer broken ends—because of increased yarn strength

Result: Higher spinning production



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Nopco FUA

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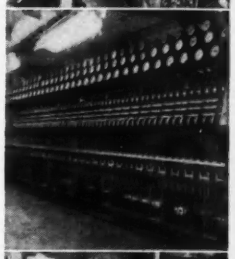
Result: No cloudy, shady piece dyeing



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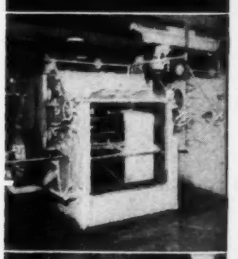

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Recently, this new Socony-Vacuum "self-scouring" wool oil was pitted against five other oils in a series of carefully controlled tests on regular production machines. The new oil showed less fly loss than any other oil. It provided more uniform yarn strength, and it was rated high in weaving, finishing, and scourability.

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• CLASSIFIED ADVERTISEMENTS •

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i.e., help wanted, machinery wanted or for sale—the rate is $7.50 per column inch or less per insertion.

WANTED: Plant chemist required for dyeing and finishing plant located in the South. Must be fully qualified to handle laboratory and operating problems on dyeing and finishing of synthetic woven fabrics, including nylon, acetate, viscose, and blends. Must have a thorough knowledge of shade matching on becks, jigs and continuous dyeing. Write Box No. 909.

ASSISTANT DYER, preferable from the Carolinas, for new Tricot Finishing Plant, located in the south. Prefer man with Nylon full fashioned dyeing experience, with proven record of production, proven ability to manage help, and excellent in color matching. Prefer age 30-40 years. Reply in full giving details pertaining to education, experience and salary requirements. Write Box No. 923.

TEXTILE SALESMAN: Well established organization desires salesman with at least five years' experience in cotton and synthetic slashing and finishing. College graduate desirable but not essential. Location in Canada. Please give details of education, experience and salary desired. Write Box No. 926.

POSITION WANTED: Hosiery dyer, thoroughly experienced on all fibers, capable of taking full charge and high production man. Write Box No. 934.

CHEMIST: For laboratory and plant work in cotton dyeing and finishing plant. Southern New Jersey. Please give full details as to experience and salary requirements. Write Box No. 935.

WANTED: SOUTHERN DYESTUFF MANUFACTURER WANTS YOUNG TEXTILE CHEMIST WITH THREE TO FIVE YEARS' PRACTICAL EXPERIENCE IN DYEING, PRINTING AND FINISHING FOR WORK IN SALES-SERVICE AND NEW DEVELOPMENT LABORATORY. WRITE, GIVING FULL INFORMATION AS TO FORMAL EDUCATION AND EXPERIENCE, MARITAL AND MILITARY STATUS. Write Box No. 932.

POSITION WANTED: Experienced hosiery dyer desires position. Sober, dependable. Further information upon request. Write Box No. 939.

WANTED: Sales Agent. Reputable manufacturer of textile chemical specialties seeks man who is calling on dyers and superintendents in Georgia and Alabama and who is interested in adding to his present income. Liberal commission arrangement. Write Box No. 940.

POSITION WANTED: Chemist-Chemical Engineer. Fifteen years experience all phases textile processing. Scouring, desizing, bleaching, dyeing, finishing. Resin emulsion research, manufacture and application. Laboratory organization and direction. Purchasing, technical service. Six years chemical process engineering, synthetic detergent manufacture. Textile consultant. Two years teaching college chemistry, State University, evenings. Desires position as technical director or director of technical service. Northeast preferred. Write Box No. 941.

POSITION WANTED: Colloid-chemist, Ph.D. employed, own car, wide experience in compounding of resins and gums—emulsions, solvent—cuts, organosols—gained in the adhesives and coatings—industries desires to extend scope of activities. A position is wanted where this knowledge can be used to mutual advantage. Write Box No. 942.

• Classified Advertisements •

WANTED: Partner in dyestuff manufacturing plant wanted. Small plant operating consistently in the black. College man preferred. Some experience in selling dyestuffs essential. Investment of $25,000 required for substantial interest. Write Box No. 943.

WOOLEN DYER—WANTED: Must be thoroughly experienced on piece dyeing and stock dyeing. Midwest location. State qualifications, past experience and salary expected. Write Box No. 944.

POSITION WANTED—Wool technologist and textile chemist over twenty years experience, desires connection in technical service or sales of dyes, finishing materials and specialties. Write Box No. 945.

POSITION WANTED—Experienced producer of textile chemical specialties, including the latest developments, such as brightening dyeing assistants, gas fading inhibitors substantive to acetates, protein-fatty acid and fatty acid-amine condensations, two liquid semidurable water repellents, etc. Address Chemical Engineer, Box 124 North Bergen, N. J.

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the substantive anti-fume that gives you real money-value!

UNFAID affords durable protection against gas fading in fabrics consisting wholly or partially of acetate.

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Assures low costs, clean fabrics, and fine finishes that appeal to today's discriminating buyers.

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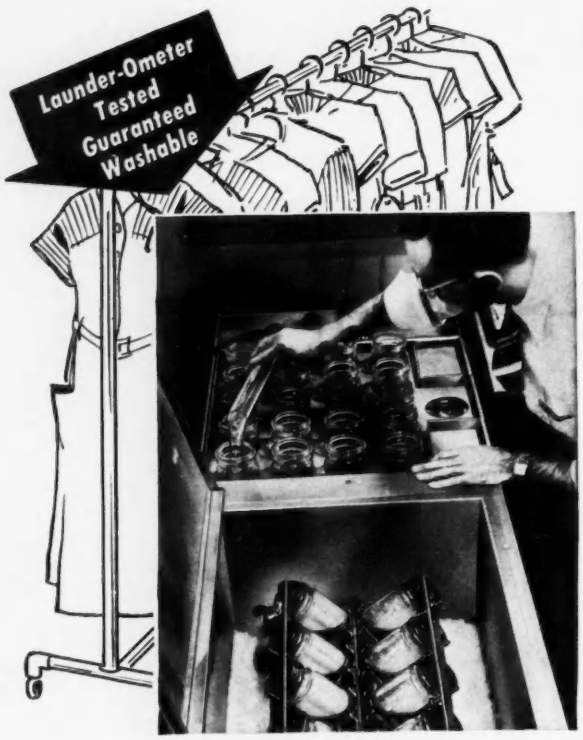

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When it comes to washable fabrics (or any other washable product) the Launder-Ometer is the machine that can give you the facts—in a fraction of the time normally required. Accepted as the standard laboratory washing machine of the American Association of Textile Chemists and Colorists, the Launder-Ometer can duplicate the effects of as many as 5 commercial launderings in one forty-five minute test. The data thus provided includes loss of tensile strength, color fastness, resistance to shrinkage, bleeding, washing and mechanical action, and other equally important information.

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Operation of the Launder-Ometer is simple. It is a carefully built machine, soundly constructed, and economical in maintenance and operating costs. Available in 3 sizes with capacities of 20 one pint jars, 20 one quart jars, or 6 two quart jars plus any combination of 10 one pint jars or 10 one quart jars. All models are electrically driven, ¼ HP to ½ HP.

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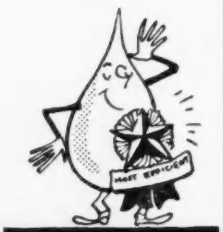

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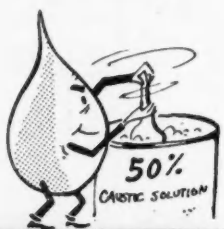

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Prevents hard water deposits and iron stains.

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Do you want to *completely* and *permanently* soften process-water *without* precipitation? Do you want Level Dyeing? Would you like uniform shades from the same formula? Do you want *softer* woolens . . . *whiter* cottons? How would you like to cut residual shrinkage in Sanforized goods? Do you want to *purify* and *stabilize* Bleach Baths? Would you like to eliminate contamination from *both* iron and hard water salts *at the same time* in Kier boiling and Mercerizing solutions? In finishing do you want to dispense with oxalate and other acid baths?

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The *Versenes* are industry's most modern chemicals. They are powerful organic complexing agents for the exacting chemical control of cations in solution. Chemically, they are the sodium salts of ethylene diamine tetra-acetic acid and other polyamino acids in liquid, powder, or bead form. They have exceptional stability at high temperature and pH. Their amazing complexing power and extreme efficiency show you the way to get better textiles through better chemistry.

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